THE

Practical Teacher

A MONTHLY EDUCATIONAL JOURNAL

Edited by JOSEPH HUGHES.

'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

VOL. V. No. 10. DECEMBER, 1885. { PRICE 6D. / POST FREE, 7½D.

Hygiene.

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Heredity.—A term which is applied by hygienists to those conditions which appear to be transmissible from parent to child, and which, when they partake of the nature of disease, have to be considered by them, especially as regards their possible removal. We find that insanity, gout, scrofula, epilepsy, cancers, and other malignant forms of disease are more or less transmissible, whilst a syphilitic taint in a secondary form most certainly when present may descend from parent to child.

It is established beyond a doubt that every plant or animal will produce others similar to itself; the conditions as to type is certain. It is said, however, by some naturalists that this applies only to typical peculiarities, to those which indicate a difference in species, but that it does not apply to smaller and accidental details. This is an important point in the hygienist's view. I am myself inclined to the opinion that the tendency to variation is limited as regards the transmission of disease. Those conditions of the body which are the result of unnatural causes, such as syphilis, cancer, and their allies, considered hereditarily are not unlimited, as to the possibility of reproduction, but have a tendency to wear out in the course of three or four generations—that is, for the stock to return to its original form. The tendency to repetition in detail, when it is not a diseased action, may or may not be continuous, but I have no doubt of the divine law that 'the sins of the fathers shall be visited upon the children to the third and the fourth generation,' but will not be visited in perpetuity.

The influence of climate in altering the conditions of life is shown in plants, which are annuals in cold regions becoming perennial at the equator, biennials may become annuals by heat or triennials by cold or cultivation.

The modifying influence of external conditions in promoting variation is well shown in the farm-yard. The horse, the dog, the ox, the sheep, the cat, and almost every domestic animal, give proof of the agency of cultivation in altering and improving the breed, and the direct influence of climate, food, and habit cannot be doubted. There is more doubt as to acquired peculiarities. The relative perfection of the senses, such as sight and smell, may be propagated, because we do not know to what extent perfection can go, but the per-contra—that is, the conditions of deafness and blindness are not transmissible, notwithstanding the evidence of the blind fish in the American caves, though it is possible that the tendency to disease which leads in those directions may be transmissible, but in a diminishing ratio from generation to generation. There have been breeds of tailless dogs and cats, but it is not certain that these have been the sequence of a repetition of amputation of that organ in the parents; but rather to the influence of other agencies which have modified or interfered with their development.

Scrofula, and with it the whole class of tubercular disease, in which we find phthisis, mesenteric disease, some forms of brain disease and glandular enlargements, are capable of transmission from parent to child. This has been fully recognised in consumptive families. It is for this reason that the life offices take cognisance of the condition not only of parents, but of collateral relations. They inquire as to the health of uncles and aunts, as well as that even of great uncles and aunts. It is found in practice that more than forty per cent. of those who are phthisical have had relations similarly affected. In ten per cent. it has been the father, in fourteen per cent. it has been the mother. The taint shows itself in the development of a liability to diseases of mucous membrane, such as bronchitis and pleuro-pneumonia, so that an insurance office looks with great suspicion at a man who has had bronchitis, and whose father or mother had died of phthisis. The children of phthisical people often die in infancy of convulsions, mesenteric disease, tubercle on the brain, asthenia, infantile diarrhœa, and other forms which are really due to the taint of birth. If they escape the diseases incidental to childhood, they may not develop the hereditary tendency, unless the surrounding circumstances are such as tend to bring into activity the dormant taint. This may arise from coddling; from being afraid of fresh air, or gorging with more food than the stomach can digest. The

proclivity to phthisis may commence at puberty, and continue to the end of life, if the conditions which may start it into activity are brought into play. The actual number of deaths from phthisis decreases from year to year, because the number living at a corresponding age decreases, but the percentage of deaths to those living at the age of the death of the patient at later years is nearly the same as at thirty. In 1853 the deaths which were caused by this disease amounted to 12·5 per cent. of the whole, whilst in 1880 it had fallen to about ten per cent. There is no doubt in the minds of hygienists that scrofula and its allies are amenable to sanitary laws, and that by promoting the observance of such laws, the disease diminishes and its hereditary tendencies are lessened.

Cancer.—There are differences in opinion as to the frequency with which this disease is propagated by heredity; whilst tubercle is decreasing, cancer is increasing in its mortal effects; it is twice as frequent among females as among males. When I was acting as House Physician at St. Thomas's in 1851, I made some inquiries upon this point among the patients who came to the Hospital. The result of my inquiries was to show that about 8 per cent. only could trace the disease to their parents. This corresponds with statistics from the Middlesex Hospital, but Sir J. Paget's observations made it 1 in 4. It has been said that cancer supersedes tubercle, and that they do not coexist; this however is not true, but I am strongly inclined to believe that as tubercle becomes less frequent there will be a greater development of cancer, because those who have escaped the one fall victims to the other disease at a later stage in life, perhaps because latent germs of tubercle under other conditions may develop into the giant cells of malignant disease.

Gout and its allies are undoubtedly hereditary. Its presence is sometimes thought to indicate a family respectability. The actual mortality which this disease produces is unknown, because a very large class of cases are never registered as gout, though they are undoubtedly gouty in their nature. In this class we find degeneration of the heart, of large blood-vessels, of the nervous system and of the secretory organs. Active gout clears the blood, and assists to prolong life, if the victim of it will recognise its nature and not add fuel to fire. Its proximate effects occur in all classes, it affects children as well as adults, females as well as males; it especially affects the nervous centres: apoplexy, paralysis, epilepsy, hysteria, insanity, asthma, and diabetes are very frequently the sequence of hereditary or acquired gout; so that under the present system of nomenclature in disease, the truth is not capable of attainment. There is, however, the satisfaction of knowing that hygienic measures when taken in connection with the change of habit on the part of the individual may do much to check the tendency to the so-called lithic acid diathesis, and remove its incidence.

I think that this diathesis may be eradicated by temperance in eating and drinking, and by a cultivation of the duty of labour, without which a man cannot be healthy or procreate a healthy offspring.

Rheumatism is allied to gout in various ways; but it is not so clearly hereditary as the lithic or gouty diathesis. There is a tendency to form lactic acid, which damp regions, when associated with malarious conditions, assist in promoting. The rheumatic poison is capable of acting with greater severity in those whose parents have been susceptible of and have suffered from its influences. It also more easily affects those who have previously suffered from its incidence. It tends to cut off its victims by early death, as well as by laying the foundation for diseases of heart and large blood-vessels, which show their effects at puberty. The victims of this disease are not so fruitful in the production of large families as healthy individuals may be. Indeed, sterility is one of the means whereby nature is able to protect the human race from continuous degeneration. This is especially brought about by rheumatic and gouty conditions of the womb, which lead to changes in its structure by which sterility is induced. It is one of the reasons why many women are barren.

Insanity.—The hereditary taint shows itself in a marked manner in various diseases which are referable to the nervous system. Changes arise later on in life which have had their first origin in the stock from whence the individual has derived his being. There is no easy means whereby we may obtain a correct insight into the statistics of this disease, because so many different forms of it exist, which when fatal are registered under different names. The hereditary influence is admitted by all writers. It is more prevalent among the descendants of the rich and luxurious classes than the laborious poor. It must not be thought that insanity necessarily shortens life to any great degree; the acute forms no doubt do so, but the chronic forms do not, when the patients are preserved from outside influences, though of course the general mortality of the insane is rather greater than that of healthy people at corresponding ages. Hygienic conditions do not so directly help to prevent its development as is the case with other hereditary taints, but habits are no doubt capable of helping to promote its increase and when those habits have a vicious tendency the chance of disease of this kind is very much increased; so also, on the contrary, healthy and natural habits will counteract the hereditary taint and prevent the establishment of the disease. It is probable that at least 25 per cent. of the victims of insanity can trace a taint of this kind to the authors of their being. It unfortunately happens that in many instances the taint is only discovered after marriage, and thus the race of insane people will not be likely to be decreased by the same method as may be brought about in other cases. Healthy parents will produce healthy children and *vice-versa*, but it does not follow that all the children of tainted parents will be also subject to the influence of the disease which attacked the parent. We have too many instances to the contrary not to know that the tissues of the tainted parent are not all affected, and that there are corpuscles in his body which are sound, just as in the fruit of a blighted cornfield there are some grains of sound corn.

Intemperance.—Recent experience shows that the heredity of this condition is a serious factor in the production of crime and its consequences. The children of drunkards are less able to bear the effects of alcoholic liquor than are the children of temperate people, and their judgment is notably defective. It is a great reason why total abstinence is a great safety to a large number of people, who may be ignorant of their tendencies. The relative mortality of intemperate people is five times as great between the ages of twenty

and thirty as is that of the temperate classes. Whilst it may be hoped that the drinking practices of the people have decreased, the sensitiveness to the evil effects are manifestly increasing; men are less able to carry away the quantity of liquor which their forefathers could do with impunity. This is a hereditary tendency, and can only be combatted by total abstinence. Intemperance increases the fatality of other diseases, and the hereditary influence comes out in the manifestation of other disorders, especially those of insanity, hysteria, and nerve disturbances in general.

(To be continued.)

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The Nääs Slöjd.

BY MISS J. WARREN,

Inspectress of Infant Schools to the Leicester Board.

Continued from page 358.

In a former paper, it will be remembered, I spoke of a system of handicraft that is at the present time finding its way into a great many elementary schools in Sweden, and in many other educational centres of Europe. Having given a slight description of my seven weeks' visit, and the general daily routine at Nääs, it will now be necessary for me to explain the work done there more fully.

In the first place, I would impress upon my readers the fact that the Nääs Slöjd is not a *trade*, nor is it the mere teaching of *tool manipulation*. I think that every other Slöjd in vogue on the Continent, and indeed, elsewhere, can be classed under one of these heads, save, of course, those branches of domestic industry which we in England are familiar with from long association, *e.g.*, needlework, cookery, etc And again, I may say that the work need not be done in wood, although this material is used at Nääs. I shall endeavour, later on, to show that this is only on account of its special suitability. Director Saloman was wont to remark after clear demonstration as to its best fulfiling all the conditions upon which their system is built: 'We work in wood, but directly any one can prove by experience that any material is more fitted for our work, we shall be quite willing to make the change.' There are several broad principles that underlie the Nääs Slöjd, and in addition, the scheme is soundly built upon eighteen rules, from which its promoters never deviate. At the risk of being tedious I shall go carefully through these *principles* and *rules*, and make what comment appears to me necessary, feeling sure that I shall carry with me those who are real educators, and not in the least caring whom else I drop by the way.

As all important things take time to perfect and mature, so we found that the beautiful simplicity and perfection of the Slöjd was the result of much hard work, earnest thought, many failures, alterations, and additions.

Time after time models were cast out and more fitting ones put in; tools were discarded, and others put in their place: one material after another received consideration.

What a lesson we learnt in Sweden of the success that invariably attends all real work!

The following are the principles upon which this special system of handiwork claims to be founded, and that will be found to permeate the work from beginning to end.

Firstly. That no system of elementary education can be complete that provides only intellectual instruction.

We are supported in this view by both old and modern reformers: one and all of whom hesitated not to urge the necessity of some manual labour in our schools, but none of whom satisfactorily dealt with the difficulties as to what form it should assume, and how it should be introduced.

Secondly. That the education of the hand is a necessary part of school life, and should enter largely into any scheme of elementary education.

This second point would take so long to consider that I refrain just now from making any special comment upon it, and I do so the more easily, in that I shall have constant occasion to refer to it throughout this and the papers that follow on the subject.

Thirdly. That being thoroughly convinced of the absolute necessity of some Slöjd system in a perfect scheme for child-education, it devolves upon us to choose such work as shall meet our requirements, and in so choosing we consider only the child and his future as a good citizen, putting all else from our minds for the time being.

Fourthly. That different people see Slöjd from different points of view.

It will be seen that these two last points give the keynote for the whole scheme, in that this very difference of view opens up the wide question of *what to teach*, and *how to teach it.*

The housewife looks at it from a domestic point of view.

The professed practical man will argue that some special trade should be taught.

The artist would make the æsthetic element paramount in such a scheme. While we as teachers have naturally the present, and future welfare of the child to consider, and therefore we look at it, and rightly from the pedagogic side—and I think it will be seen that this is the right way of studying the subject after all, and embraces in a measure all that it is well to retain of the other views. It is certainly not sufficient to be able to say that because a thing is useful, it therefore shall find a place in elementary education; it may be positively dangerous to a child to introduce it. Again, though æsthetic education should never be lost sight of, we have to study first the true—Truth in itself being beautiful—it will be seen that the artistic element is by no means wanting.

Fifthly. That any system introduced shall give the child a love of, and proper reverence for labour, and a desire to do it.

All kinds or every kind of work would not accomplish this end, and where no handicraft is taught, it is quite impossible to instil this God-given love of work for its own sake—it is just the difference in the work of a slave and a free man. We shall endeavour to train the children to think of hand labour as a beautiful addition to their lives. A Slöjd system however perfect in other respects, failing this, is incomplete.

These then, are some of the *ideas* upon which the Nääs system of Slöjd is built; but I have very much curtailed my remarks in order not to weary my readers, and for this purpose I have therefore refrained from mentioning by name the educational reformers who from time to time have advocated handicraft—to all of us as teachers they are familiar.

A child's intellectual nature develops later than its material, and the activity of childhood needs some employment. In the Slöjd schools of Sweden it has been found that any misdemeanours in the studies, are sufficiently met by a refusal to permit the child to Slöjd. In my next paper I shall give the *rules* upon which the wood Slöjd is arranged, and if space permit those that have special reference to the series of models from which the children are taught. I shall have occasion also to compare this with other sets that might be drawn up.

(To be continued.)

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Lessons in Latin.

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(*Continued from page 400.*)

KEY TO EXERCISES.

EXERCISE 63.

A.

1. We are not such people as those to whom nothing seems to be true, but such as say that to all truths certain falsities are added. 2. In fine, be unwilling to forget (a very strong 'don't forget') that you are Cicero, and such a one as has been accustomed to advise others. 3. Can such a man, who places the highest good in pleasure, be one who is able to praise temperance? 4. Whatsoever that is which is becoming, it then appears (so) when honesty has gone before. 5. A matter small in the saying, but of such a kind that it issued in a violent contest. 6. Cicero, who had kept his soldiers in camp through all the preceding days, on the seventh day sent cohorts to forage. 7. Who am I, whose ears it is wicked should be hurt? 8. Artaxerxes had given the city (of) Lampsacus to Thucydides, that he might obtain wine thence. 9. I am greater than one whom fortune can hurt. 10. A great punishment for my error has been inflicted, that not only am I vexed with my foolishness, but also ashamed ('being one'), who did not understand whom I could trust as my friends.

B.

1. Non sum ego is consul, qui, ut plerique, nefas esse arbitrer, Gracchum interfici. 2. Nunc dicis aliquid quod ad rem pertineat. 3. Non is sum qui, quidquid videtur, tale dicam esse, quale videatur. 4. Innocentia est affectio talis animi quae noceat nemini. 5. Quid est quod tu cum fortuna queri possis? 6. Habetis eum consulem qui parere vestris decretis non dubitet. 7. Non is es Catilina, ut te aut pudor a turpitudine, aut metus a periculo, aut ratio a furore, revocaverit. 8. Fraus mea quid petiit nisi quo tibi jungerer uni? 9. Major sum quam ut mancipium sim mei corporis. 10. Nihil tanti fuit quo venderemus fidem nostram et libertatem.

EXERCISE 64.

A.

1. Many were found who were prepared to sacrifice not only their money, but even their life, for their country. 2. There is no one who does not know that that was done by your opponents, by which the less a secession might be made (that is, 'to prevent a secession' of certain voters to the other side). 3. It is not that you envy those whom the people call great and happy. 4. How many (that, is 'how few') are there by whom wisdom seems to be preferred to all riches! 5. Why is it that your grief moves you so greatly? 6. What ardour for study do you think there was in Archimedes, who, whilst he is drawing certain things in the dust so attentively (not an uncommon use of comp.), did not feel even that his country had been taken? 7. But there are many who seize from others, that they may bestow them on others. 8. Pleasure is not worthy for a wise man to look back at. 9. You are the only Caesar in whose victory no one fell unless he were armed. 10. Whomsoever the lictor caught, the tribune ordered to be sent.

B.

1. Sunt qui censeant una animum et corpus occidere. 2. Nihil est quod tam miseros faciat, quam impietas. 3. Vix ullum erat scutum quod non plura simul spicula perforavissent. 4. Quis est qui non oderit protervam adolescentiam. 5. Caninius fuit mirifica vigilantia, qui suo toto consulatu somnum non viderit. 6. O fortunate adolescens, qui tuae virtutis Homerum praeconem inveneris. 7. Octo millia servorum qui militarent a dominis empta sunt. 8. Livianae fabulae non satis dignae sunt quae iterum legantur. 9. Unus eris in quo nitatur civitatis salus. 10. Semper habiti sunt fortissimi qui summam imperii potirentur.

EXERCISE 65.

A.

1. Philip was slain close to the theatre by Pausanias, when he went to see the plays. 2. Maecaenas goes to play, I and Virgil to sleep. 3. Ambassadors came from Rome to complain of their injuries and to seek for restitution according to the treaty. 4. When most disgraceful men have dishonoured themselves with crimes, they go to seize the rewards of good men. 5. Dumnorix settled his kinswomen to marry amongst the other States. 6. What is so pleasant for knowing and hearing as a speech adorned with wise opinions and weighty words? 7. What is disgraceful to be done, the same is also base to be spoken. 8. The story will be short, if it does not advance further in the telling, than what is necessary for the knowing. 9. That example has been put forward to be imitated both by me and by you. 10. The wise man will give you the reasons as to what is better in the avoiding and what is better in the seeking.

B.

1. Cur te is perditum? 2. Milites sunt missi speculatum arcem. 3. Coriolanus in Volscos exsulatum abiit. 4. Cæsar contractis undique copiis exercitum suum hiematum in fines Aeduorum duxit. 5. Fabius Pictor Delphos ad oraculum missus est sciscitatum, quibus precibus opus esset ad deos placandos. 6. Pleraque dictu quam re sunt faciliora. 7. Quod optimum factu videbitur, facies. 8. Nihil suavius est auditu, quam fidorum amicorum consilia. 9. Multa, quae visu terribilia erant, post longa tempora narrata audientium animos delectant. 10. Quaeramus quid optimum factu sit, non quid usitatissimum.

LESSON LXVI.

A STORY EXTRACTED FROM LIVY, BOOK I., CH. 24, 25.

537. Instead of an exercise we subjoin some Livy. Some sentences are left out, and some shortened by the omission of parenthetical clauses, but these omissions in no way affect the construction.

538. VOCABULARY 66.

English.	*Latin.*		*Derivatives.*
Three at a birth	trīgēmini, pl., O decl.		
Unequal	dispar, adj.	G. disparis	disparity
Scarcely	fermē, adv.		
To incline to	inclīnāre	R. inclin	inclination
To make arrangements	ăgĕre (see Vocab. 50)		
Each	quisque, quaeque, quidque, decl. like quis.		
To refuse / To object	rĕcūsāre	R. recus	
To be fit	convĕnīre	P. R. convĕn	3rd R. convent
As	sicut, adv.		
Spirited	fĕrox	R. feroc	ferocious
Disposition	ingĕnium	G. ingenii	ingenuous
To exhort	adhortari, dep.		3rd R. adhortāt
To advance	prŏcēdĕre	P. R. process	3rd R. process
Signal	signum	G. signi, n.g.	
Three (distributive) / *i.e.*, set of three.	terni, -ae, -a		
To rule	imperītāre, frequentative of imperare		
To run together	concurrĕre	P. R. concurri	3rd R. concursum
Public	publicus -ca -cum		R. public
Slavery	servītium	G. servitii, n.g.	
To turn towards	obversāri, dep.		
Afterwards	deindĕ, adv.		
Fortune	fortūna	G. fortunae	fortunate
Running together	concursus	G. concursūs	concourse
To clang	increpāre	R. increpu	3rd R. increpit
To shine	fulgĕre	P. fuls	
To glitter	micāre	P. R. micu	mica
To thrill	perstringĕre	P. R. perstrinx	3rd R. perstrinct
To be numb	torpeo	No P. or 3rd Root	torpid
Breathing	spīritus	G. spiritūs	spiritual
Consĕrĕre manibus, to join hand-in-hand, *i.e.*, in a deadly combat.			
Expire	expirare	R. expir	expiration
To fall together	corruere	P. R. corru	
To cry together	conclāmāre	R. conclam	
To desert	dēsĕrĕre	P. R. deseru	3rd R. desert
Lifeless	exānīmis, n. -me.	G. exanimis	
Change, hence Fate	No Nom., G. vĭcis, Acc. vicem		vice-president
To separate	sēgrĕgāre	R. segreg	
To take to	cāpessere	capess.īv	3rd R. capessit
To suppose	rēri, dep.		3rd R. rāt
To weaken	afflĭcĕre	2nd R. afflĕc	3rd R. affect
Somewhat	aliquantus -ta -tum	R. aliquant.	
Space	spātium	G. spatii, n.g.	
To fly from	aufŭgĕre	P. R. aufŭg	No 3rd R.
Distance	intervallum	G. intervalli, n.g.	
Far off	prŏcŭl, adv.		
Rush	impĕtus	G. impetūs	impetuous
To cry out	inclāmāre	R. inclam	
Assistance	ops	G. ŏpis (see Vocab. 53)	
To conclude	dēfungi, dep.	3rd R. defunct, gov. Abl.	
To hasten	festinare	R. festin	
To equal	aequāre	R. aequ.	equation
One (distributive)	singuli, pl., *i.e.*, one of each		
Untouched	intactus -ta -tum		intact
To double	gĕmĭnāre	R. gemin	
Wearied	fessus -sa -sum		
Slaughter	strāges	G. stragis	
To oppose to	objĭcĕre	P. R. objec	3rd R. object
The shades	mānes	G. manium, no sing.	
To exult	exultāre	R. exult	
This here	hic -ce, haec -ce, hoc -ce (see Less. 37)		
To hold up	sustĭnĕre	P. R. sustinu	3rd R. sustent
From above	sūpernē, adv.		
Throat	jūgŭlum	G. juguli, n.g.	jugular
To fix	dēfīgĕre	P. R. defix	3rd R. defix
To spoil	spŏlĭāre	R. spoli	spoliation
To rejoice	ŏvāre	R. ov	ovation
To congratulate	grātŭlāri, dep.		congratulation
Fear	mĕtus	G. metūs	

539. EXERCISE 66.

THE FIGHT OF THE HORATII AND THE CURIATII.

The cause of this celebrated duel was as follows: Tullus Hostilius (third King of Rome), being anxious to gratify his martial tastes, found an excuse in some depredations made by the Albans, and marched against them for the purpose of having a pitched battle. Whilst waiting to begin, the Alban general proposed that the matter of dispute, and the future sovereignty of their respective peoples, should be referred to a single combat. To this the king and his soldiers gladly acceded, each hoping he might be chosen as the champion for his country.

Forte (60) in duobus (44) tum (20) exercitibus (19) erant trigemini fratres (14) nec (48) aetate (44) nec viribus (53) dispares. Horatios Curiatiosque fuisse (38) satis (46) constat (36), nec (48) ferme res (63) antiqua (45) alia (31) est nobilior (38): tamen (20) in re (63) tam (58) clarâ (62) nominum (20) error (46) manet (23), utriusque (3) populi (16) Horatii (6), utrius (31) Curiatii fuerint (38): auctores (37) utròque (31) trahunt (26): plures (49) tamen (20) invenio (28), qui (30) Romanos Horatios vocent (11): hos (37) ut sequar (63), inclinat animus (45). Quum (13) trigeminis agunt (50) reges (8), ut pro (28) suâ (20) quisque patriâ (10) dimicent[1] (20) ferro (41): ibi (28) imperium (19) fore (= futurum esse, fut. inf. of esse), unde (41) victoria (37) fuerit (38). Nihil (31) recusatur. Tempus (17) et locus (29) convenit. Priusquam (52) dimicarent (20), foedus (65) ictum (44) inter (42) Romanos et Albanos est his (37) legibus (5), ut, cujusque populi (16) cives (8) eo (37) certamine (28) vicissent (54), is (37) alteri (31) populo (16) cum (20) bonâ (20) pace[2] (9) imperitaret. Foedere (65) icto (44) trigemini sicut convenerat arma (36) capiunt (26); feroces et suopte[3] ingenio et pleni (61) adhortantium vocibus (7) in medium (35) inter (42) duas (44) acies (35) procedunt. Datur (62) signum, terni juvenes (41) magnorum (20) exercituum (19) animos (54) gerentes (43) concurrunt. Nec (48) his (37) nec illis (37) periculum (55) suum (20), publicum imperium (19) servitiumque obversatur animo (54) futura (Eng. 'will be') que ea (37) deinde patriae (10) fortuna, quam (27) ipsi (40) fecissent (31). Ut primo (47) statim (18) concursu increpuerunt arma[4] micantesque fulserunt gladii (16) horror (35) ingens (29) spectantes (60) perstringit, et neutro (31) inclinata spe (41) torpebat vox (17) spiritusque. Consertis deinde manibus, duo Romani super (42) alium (31) alius vulneratis (17) tribus (44) Albanis exspirantes corruerunt. Ad quorum (27) casum (55) quum conclamavisset gaudio (27) Albanus exercitus (19), Romanas legiones jam (33) tota (31) spes (41), nondum (42) tamen cura (60) deseruerat exanimes vice[5] unius (44), quem tres Curiatii circumsteterant (35). Forte (60) is integer (35) fuit (38), et ut segregaret pugnam (43) eorum (37), capessit fugam (35), ita (17) ratus secuturos (63), ut quemque vulnere (40) affectum corpus (15) sineret (52). Jam[6] aliquantum spatii ex eo loco (29), ubi (49) pugnatum (10) est, aufugerat, quum respiciens (64) videt (27) magnis (20) intervallis sequentes (63), unum (44) haud (56) procul sese (35) abesse (50). In eum magno (20) impetu rediit (56) et, dum (21) Albanus exercitus inclamat Curiatiis uti (for 'ut') opem ferant (53) fratri (14), jam Horatius, caeso (43) hoste (10) victor (42) secundam (47) pugnam (43) petebat (65). Tum (20) Romani adjuvant (52) militem (6) suum (20), et ille (37) defungi proelio (26) festinat. Prius (51) itaque quam[7] alter (31), qui nec procul aberat (50), consequi (63) possit (50), et alterum (31) Curiatium conficit (26): jamque aequato Marte[8] singuli supererant (50) sed (6) nec spe nec viribus pares (57). Alterum (31) intactum ferro (41) corpus et geminata victoria ferocem in certamen tertium (47) dabant, alter fessum vulnere (40) fessum cursu (59) trahens (26) corpus victusque (54) fratrum (14) ante (43) se (35) strage victori (31) objicitur hosti. Nec illud (37) proelium[9] fuit. Romanus

exsultans, 'Duos' inquit (56) 'fratrum Manibus dedi (62), tertium (47) causae (37) belli (16) hujusce, ut Romanus Albano imperet (36), dabo': male (51) sustinenti arma (36) gladium superne jugulo defigit, jacentem (49) spoliat. Romani ovantes ac (33) gratulantes Horatium accipiunt (43) eò (37) majore (49) cum gaudio, quò (58) prope (44) metum res (13) fuerat.

[1] The plural 'dimicent' agrees with 'trio' (a noun of multitude), understood.

[2] 'With a secure peace.'

[3] For 'suo,' their own.

[4] 'Arma' are the defensive arms which were worn, whereas 'tela' and 'gladius' were the weapons used.

[5] 'Vicis' (gen.) means 'turn,' and then 'fate,' and lastly, 'in the place of,' hence 'vicarious,' which means 'for another.'

[6] 'Jam' refers to the time of which the writer is writing; 'nunc' refers to the time at which the writer is writing.

[7] 'Priusquam' is often separated by a word.

[8] 'Aequato Marte' literally means 'Mars or the battle being made equal'—that is, now they were one to one instead of being three to one, as they had been.

[9] 'Not worthy of the name of battle.'

LESSON LXVII.

Prepositions.

540. Though we generally talk about prepositions governing case, it has been cleverly suggested by a modern grammarian that the cases govern the prepositions—that is, the case which follows the preposition determines its meaning.

541. The following prepositions are only found with the accusative:—ad, *to* or *near;* adversus, *against;* ante, *before;* apud, *at;* circa and circum, *around;* circiter, *about;* cis and citra, *on this side;* contra, *against;* erga, *towards;* extra, *without;* infra, *beneath;* inter, *among* or *between;* intra, *within;* juxta, *near;* ob, *because of;* penes, *in the power of;* per, *by* or *through;* pone, *behind;* post, *after;* praeter, *beside;* prope, *near;* propter, *because of;* secundum, *according to, after;* supra, *above;* trans, *across;* versus, *towards;* ultra, *beyond.*

542. The following prepositions are only found with the ablative:—a, ab, abs, *from* or *by;* absque, *without;* coram, *in the presence of;* cum, *with;* de, *down from* or *concerning;* e, ex, *out of* or *from;* prae, *before* or *owing to;* pro, *in behalf of* or *owing to;* sine, *without;* and tenus, *as far as.*

543. The following prepositions are found with either case, and it will be noticed that when found with the accusative there is always a sense of motion, but when found with the ablative the idea of rest is implied:—First, with the accusative: in, *into* or *against;* super, *above;* sub or subter, *under.* Second, with the ablative: in, *in* or *on;* super, *upon* or *concerning;* sub, *beneath,*

544. In the following exercises the context will always give the peculiar meaning of the prepositions:—

545. Vocabulary 67.

English.	*Latin.*		*Derivatives.*
Favour	grātia	G. grātiae	gratitude
To obtain	consĕqui, dep. (see Vocabs. 38 and 66)		
To direct towards	adhĭbēre	P. R. adhĭbu 3rd R. adhĭbit	
Reverence	rĕvĕrentia	G. reverentiae	reverential
To discover	dētĕgĕre	P. R. detex 3rd R. detect	
Health (state of)	vălētūdo	G. valetudinis	valetudi-[narian
To sail	nāvigare	R. navig	navigation
To expel	expellĕre	P. R. expul 3rd R. expuls	
Because	quod, a conj.		
Watch (a period of time)	vigĭlia	G. vigiliae	vigil
To set out	prŏfĭcisci, dep.	3rd R. profect	
Capability	făcultās	facultatis	faculty
To corrupt	corrumpĕre	corrŭp	corrupt
To announce	nuntiāre	R. nunti	annunciation
Gate	jānua	G. januae	janitor
Soothsayer	hăruspex	G. haruspicis	
Image	simŭlācrum, n.	G. simulacri, n.g.	
East (rising)	ŏriens	G. orientis	orient
It happens	fit (followed by ut with sub.)		
By a little	paulo, abl. of paulus, used as adv.		
To avenge	ulcisci, dep.	3rd R. ult	
To throw across	trājĭcĕre	P. R. trājec 3rd R. traject	
Scythian	Scythae, plu.	A decl.	
To reach	pervĕnire	P. R. pervēn 3rd R. pervent	

546. Exercise 67.

A.

1. Num (55), si (15) ad centesimum (47) annum (17) vixisset (48) Scipio, senectutis (48) eum (37) suae (20) poeniteret (48)? 2. Gratiam consecutus est apud bonos (20) viros (18). 3. Adhibenda est igitur (30) reverentia quaedam (64) adversus homines (5). 4. Mores (56) puerorum (7) detegunt se (35) inter ludendum (65). 5. Quum (13) per valetudinem et per anni (17) tempus (17) navigare poteris (50), ad nos (35) veni (19). 6. Secundum Deos (27) homines (5) hominibus maxime (51) utiles (53) esse (38) possunt (50). 7. Aristides patria (10) expulsus est quod praeter modum (56) justus (57) esset (38). 8. Caesar de tertia (47) vigilia cum legionibus (19) tribus (44) e castris (37) profectus est. 9. Atticus honores (49) non petiit (65) quod (27) geri (43) e (Eng., 'for the advantage of') republica (45) non possent (50) sine periculo (55) corruptis civitatis (14) moribus (56). 10. Epaminondas quantum [=ut tantum (54)] quisque (66) daret (62) pro cujusque (66) facultatibus imperabat (36).

B.

1. It was announced to Simonides (I decl.) that two (44) youths (41) were standing (42) at the gate. 2. The soothsayers ordered (29) the image of Jupiter (Jovis) to turn (55) toward the east. 3. It often (35) happens that those (37) who owe (money) (46) do not answer (18) at the time (17). 4. Uri (same word, 'a huge ox') are in greatness (57) little beneath elephants (35). 5. They determined (54) to avenge the injuries (54) through you (35). 6. All (29) (things) which are done (56) according to nature (46) must be held (49) among (Lat., 'in') good (20) (things). 7. Darius having thrown an army (19) across from Asia into Europe (Europa, A decl.) decreed (41) to carry on war (16) against the Scythians. 8. Miltiades (same word), not doubting (52) that his (20) designs [counsels (40)] would reach (to) the ears (50) of the king (8), left (26) the Chersonese (Lat., -sus, O decl.). 9. At this (37) time (17) no (31) State (14) was a help (37) (use dative) to the Athenians (46) except (that) of the Plataeans (Platæensis, plu., I decl.); it (37) sent (43) a thousand (44) soldiers (gen.) (6). 10. He is distant (50) from the town (7) about ten thousands (44) of paces (44) (ten miles).

LESSON LXVIII.

Prepositions in Composition.

547. Prepositions are considerably used in word-

building, and are very frequently found as a constituent part of a verb.

548. The meanings of prepositions in verbs are primarily what they are in their simple form, but sometimes they only intensify the meaning of a verb. This may be especially said of 'con' (cum) and 'per.'

549. The last letters of prepositions in composition are often altered for the sake of euphony; thus 'adferre' becomes 'afferre,' and 'adlatum' is found 'allatum.'

550. The preposition 'trans' in composition becomes 'tran' before words beginning with s, as 'transcribo,' and 'tra' before other consonants.

551. VOCABULARY 68.

English.	*Latin.*		*Derivatives.*
To stand out / To arise	exstare	P. R. exstit	exstlt
Somewhat difficult	subdifficilis, -le	R. subdificil	
Question	quaestio	G. quaestionis	
When	quando, conj.		
To desire	dēsīdĕrāre	R. desider	
Booty	praeda	G. praedae	
Tribute	tribūtum	G. tributi, n.g.	
Prizefighter	pūgil	G. pugilis	pugilist
To strike	ferīre	No P. or 3rd R.	
To groan	ingĕmiscĕre	P. R. not found	
To covet	expĕtĕre	expĕti	expetlt
To accomplish	efficĕre	P. R. effēc	3rd R. effect
To affirm	praedicare	R. praedic	predicate
Free	liber -era -erum	R. liber	liberate
To go through	pĕrāgĕre	P. R. perēg	3rd R. peract
Oath	jus -jurandum	G. juris-jurandi,	both parts declined
To put on	ădĭgere	P. R. adeg	3rd R. adact
Sum	summa	G. summae	summation
Harmony	concordia	G. concordiae	concord
To obtain	adipisci, dep.		3rd R. adept
Moon	lūna	G. lunae	lunar
To be wanting / To be eclipsed	dĕfĭcĕre	P. R. dēfēc	3rd R. defect
Whether	num, conj.		
To turn out	ēvĕnīre	P. R. evēn	3rd R. event
Rightly	recte, an adv.		
To take from	dētrăhĕre	P. R. detrax	3rd R. detract
To hang	suspendĕre	P. R. suspend	3rd R. suspens
Deserter	transfūga	G. transfugae, c.g.	
Witness	testis	G. testis, c.g.	testimony
Sicily	Sicilia	G. Siciliae	
To choose	ēligĕre	P. R. elēg	3rd R. elect
To rejoice	gaudĕre	Perf. gravisus sum, semi, dep.	
To arrive	advĕnīre	P. R. advēn	3rd R. advent
To live	habitare	R. habit	habitation
To invent	invĕnīre	P. R. invēn	3rd R. invent
To retire	rĕcēdĕre	P. R. recess	3rd R. recess

552. EXERCISE 68.

A.

1. Exstitit hoc (37) loco (29) quaedam (64) quaestio subdifficilis, num (Eng., 'as to') quando amici (5) novi (33) veteribus (49) sint (38) anteponendi (45). 2. Socrates in pompa (28) quum magna (20) vis (54) auri (40) argentique (45) ferretur (53), 'quàm (55) multa (20) non desidero' inquit (56). 3. Unius (31) imperatoris (23) praeda finem (40) attulit (53) tributis. 4. Pugiles etiam (34) quum (13) feriunt adversarium (64) ingemiscunt. 5. Sapientia (6) non expeteretur si (15) nihil (31) efficeret. 6. Verum (Eng., 'granting') ut ita (17) sit (38), non potes (50) hoc (37) praedicare. 7. Liberi jam (33) hinc (35) popŭli (16) Romani res (13) pace (9) belloque (16) peragam. 8. Jurejurando adegit neminem (17) Romae passuros (45) regnare (4). 9. Patrum (14) numerum (14) ad summam tricentorum (44) explevit (46). 10. Id (37) profuit (50) ad concordiam civitatis (14).

B.

1. Each (66) remained (Lat., 'obtinere,' to keep) (in) his own (20) house (1) at that time (20). 2. He obtained the highest (49) honours (49) from the Roman people (16). 3. Many (20) nations (38) do not yet (42) know (14) why (33) the moon is eclipsed (Lat., 'eclipses'). 4. I ask (19) whether they would turn out otherwise (56) than (Lat., 'ac') they do turn out. 5. Those (37) (things) are rightly held (49) as the 'spolia opĭma' which the leader (39) has taken from a leader. 6. They hang traitors (28) and deserters on trees (1). 7. When (13) I shall produce (Lat., 'give') (62) witnesses from Sicily, he may choose whom he shall wish (53). 8. I rejoice that you (35) are arrived safe (37). 9. It is allowed (36) that laws (5) were invented for the safety (64) of the citizens (8). 10. Themistocles (same) retired to Argos (same) to live (supine).

(To be continued.)

—o—

How I Teach Domestic Economy.

BY MRS. WIGLEY,

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CHAPTER X.

'MUCH USE, GREAT WEAR.'

WE have still to make the children see that something else has to be done by food, besides keeping up our internal heat. They will understand by this time how the food is reduced and conveyed to every part of the body and how heat is formed. We must see now that they clearly understand why the food must go to every part of the body.

If we go to a class and put the question, we shall soon find out that their knowledge of the matter is rather clouded. And the lesson would proceed something after this fashion. You select one child whose father, perhaps, mends shoes and you ask,—

'What work does your father do, Nelly?' 'Please, ma'am, he mends shoes.' 'What does he mend shoes for?' 'Because people wear them out.' 'How do they do this?' 'They use them every day.' 'Yes, they put them on their feet and walk in them, and the leather wears away. What other things will wear out?' 'Everything we use.' 'Quite right. Now let us think of some soft things that wear out when we use them.' 'Our clothing.' 'Certainly. Which part of our clothing wears first.' 'The part that gets the most rubbed.' 'Yes, if we work our arms we wear our dresses under the arms. If little boys kneel down to play they wear their trousers at the knees. Now think of some hard things, and tell me why they wear.' 'Coal boxes wear through carrying coals.' 'Spades wear out through digging.' 'Steps wear out through being walked upon.' 'Kettles wear out through being put on the fire.' 'Pump handles wear out by being worked up and down.' 'You are quite right—the hardest iron, the strongest machine, the firmest joint, will all wear away'—'By use.' 'Now what am I doing?' 'Moving your arm up and down.' 'How is it that I am able to do this?' 'Because your arm has a joint.' 'How often have I moved this joint?' 'Every day.' 'All your life.' 'Yes, we all of us constantly make use of our joints. Which part of our bodies do we use most?' 'Our hands.' 'And how do our hands feel?' 'Soft.' 'Now you said the things we used every day wore out, and the softest things wore out first. Why do not our arm-joints wear out as well as the pump-handle, and our hands

as quickly as our dresses?' 'Because we are growing.' 'But I am not growing.' 'Because we are alive.' 'But some people who are alive cannot lift their arms, and their hands get thinner and thinner. What people do I mean?' 'Sick people.' 'So it is not being alive that keeps us from wearing out. Not long ago that window was broken. Why is it not broken now?' 'Because the man mended it.' 'If a new little girl came, how could she tell it had been mended?' 'She could not tell at all, because it does not show.' 'Why does it not show?' 'Because it is nicely mended.' 'Because there is some more glass put in just like it.' 'You are quite right; if the mended place does not show, then the mending must be nicely done, and with some of the same stuff. Just now we said sick people get thinner and thinner. Why?' 'Because they cannot eat any food.' 'Suppose a family of little children got very little food for a long time, how would they look?' 'Very thin.' 'And if no one gave them any for yet more days, what would happen?' 'They would pine away and die.' 'What do you mean by "pine away?"' 'Waste away.' 'What would keep them from pining or wasting away?' 'Giving them food.' 'What would prevent them wasting or wearing away?' 'Having food to eat.'

'Now think about this—Why do we eat food?' 'Because we are hungry.' 'You are quite right; but I want another reason. 'You tell me that things that get worn "must be mended." You tell me that if they are nicely mended "you cannot see the place." You tell, too, that people who cannot eat "waste away." And you tell me, besides this, that poor, half-starved, wasted children get fat again if "they get food." Now tell me why our joints and our flesh do not wear out by use?' 'Because we can eat food.' 'That is it. Our food makes good what we wear away by constant using. What do we call making good again places that are worn?' 'Mending.' 'Yes; and there's another word still.' 'Repairing.' 'So we say that food has to repair those parts in our bodies which get worn from daily use.'

'What work does food do in our bodies?' 'Repairs the worn-out parts.' 'Keeps up the internal heat.' 'You know how the food is reduced to a milky fluid, and how it is carried through the tiny channels in the blood to every part of the body, and how the little organs take out what they require to mend or repair the parts they have to supply. Now what is it they require?' 'Food.' 'But what is food to them?' 'That which we eat.' 'Not quite right; think a little. What is the work of these little organs?' 'To mend and repair the worn parts.' 'Well, what will they require for their work? What did the man need to mend the window?' 'Glass.' 'Why?' 'Because the window was made of glass.' 'What would be wanted to mend a chair?' 'Wood.' 'Why?' 'Because the chair is wooden.' 'Quite right. We mend iron with'—'Iron;' 'and wood with'—'Wood?' and silk with'—'Silk,' and so on. 'Whenever we want to do any mending we must procure some of'—'The same material that it is made of.'

'What do the little organs do for our bodies?' 'Keep them in repair.' 'How do they get material to repair with?' 'It is supplied by the food.' 'What sort of material must they get in the food?' 'All the kinds that are found in the body.'

(To be continued.)

Recent Inspection Questions.

[The Editor respectfully solicits contributions—all of which will be regarded as STRICTLY PRIVATE*—to this column. For obvious reasons, it cannot be stated in which district the questions have been set.]*

Arithmetic.

STANDARD I.

(Nos. dictated.)

(1) From 504 take 39. 465. Ans.

(2) Add 379, 298, 9, 15, 909. 1610. Ans.

(3) Write 4 times.

STANDARD II.

(Nos. dictated.)

(1) Divide 37,209 by 8. $4651\frac{1}{8}$. Ans.

(2) From 50,901 take 9009. 41,892. Ans.

(3) Multiply 36,428 by 73. 2,659,244. Ans.

STANDARD III.

(A card.)

(1) From one hundred and four pounds thirteen shillings and a halfpenny take eighteen pounds fourteen shillings and sixpence three farthings.

£85 18s. $5\frac{3}{4}$d. Ans.

(2) What is the fifty-sixth part of a million and a half? $1{,}500{,}000 \div 56 = 26{,}785\frac{40}{56}$. Ans.

(3) Add £409 19s. $3\frac{1}{2}$d., £739 2s. $11\frac{1}{4}$d., £88 18s. $8\frac{1}{4}$d., £4296 11s. $7\frac{1}{2}$d., £5 17s. 7d.

£5,540 10s. $1\frac{1}{2}$d. Ans.

(4) A gentleman spent £200 10s. 6d. on his drawing-room, and eighty guineas on his dining-room. How much did they cost together? and how much did the drawing-room cost more than the dining-room?

£284 10s. 6d.: £116 10s. 6d. Ans.

STANDARD IV.

(A card.)

(1) Find the 37th part of £2096 13s. 9d.

£56 13s. $4\frac{5}{37}$d. Ans.

(2) Reduce 12 miles 13 poles 2 feet to inches.

762,928 inches. Ans.

(3) What will twelve dozen yards of satin cost at fifteen shillings and elevenpence three farthings per yard?

£115 1s. 0d. Ans.

(4) A baker received 5 sacks of flour, each containing 2 cwt. 28 lbs.; how many $2\frac{1}{2}$ lb. loaves can be made out of the flour?

2 cwt. 28 lbs. $\times 5 = 252$ lbs. $\times 5 = 1260$ lbs.

$1260 \div 2\frac{1}{2} = 504$ loaves. Ans.

STANDARD V.

(A card.)

(1) A ship made a voyage of 12,000 miles in 40 days; at what rate per hour would it have sailed if the voyage had lasted 35 days?

No. of miles in 35 days = 12,000
" " 1 " = $\frac{12000}{35}$
" " 1 hr. = $\frac{12000}{35 \times 24}$

$$\frac{\overset{100}{\cancel{500}}}{\underset{7}{\cancel{35 \times 24}}} = \frac{100}{7} = 14\frac{2}{7} \text{ miles. Ans.}$$

(2) Find the amount of the following bill, and properly receipt it:—

Nov. 10th, 1885.

Mr. Wm. James,

Bought of Henry Hastling.

	£	s.	d.
10 casks of apples, each containing 250 at 2¼d. a score	1	3	5¼
1½ boxes of oranges at 15s. 9d. per box	1	3	7½
25 boxes of figs at 9¾d. each	1	0	3¾
Ans.	3	7	4½

Received with thanks,
Nov. 10th, 1885.

£3 : 7 : 4½
Henry Hastling.

(3) Find the value of 491¼ yards of cloth at 8s. 4½d. per yard.

	£	s.	d.		yds.
	491	0	0	= price of 491 at £1	
4s. = ⅕ of £1 =	98	4	0	= "	" 4s.
4s. = ⅕ of £1 =	98	4	0	= "	" 4s.
4d. = 1/12 of 4s. =	8	3	8	= "	" 4d.
½d. = ⅛ of 4d. =	1	0	5½	= "	" ½d.
¼th of 8s. 4½d. =	0	2	1⅛	= "	¼ yd. at 8s. 4½d.
	£205	14	2⅝	= 491¼ yds. at 8s. 4½d.	

(4) What fraction of a plum pudding would be left if ⅖, ⅓, ¼, and 1/10 had been taken away?

$$1 - \left(\tfrac{2}{5} + \tfrac{1}{3} + \tfrac{1}{4} + \tfrac{1}{10}\right)$$
$$= \tfrac{180}{180} - \left(\frac{40 + 60 + 45 + 18}{180}\right)$$
$$= \tfrac{17}{180}. \text{ Ans.}$$

STANDARD VI.

(*A card.*)

(1) Find the Greatest Common Measure of 84,175 and 99,900.

G.C.M. = 925. Ans.

(2) Find the difference between seven-eighths of a shilling and two-thirds of eighteenpence, and reduce the result to the fraction of half a sovereign.

$$\frac{\frac{2}{3} \text{ of } 18\text{d.} - \frac{7}{8} \text{ of } 1\text{s.}}{10\text{s.}}$$
$$= \frac{\frac{2}{3} \times \frac{18}{1} - \frac{7}{8} \times \frac{12}{1}}{120}$$
$$= \frac{12 - 10\frac{1}{2}}{120}$$
$$= \frac{1\frac{1}{2}}{120}$$
$$= \tfrac{1}{80}. \text{ Ans.}$$

(3) A grocer bought 13·5 lbs. of honey for £1·25, what would 62·75 lbs. cost at the same rate?

Cost of 13·5 lbs. = 1·25
" 1 " = $\frac{1{\cdot}25}{13{\cdot}5}$
" 62·75 " = $\frac{1{\cdot}25 \times 62{\cdot}75}{13{\cdot}5}$
$= \frac{78{\cdot}4375}{13{\cdot}5}$ = £5 16s. 2½d. Ans.

(4) What will £175 amount to in 3½ years at 4¼ per cent. per annum simple interest?

$$£175 + \frac{175 \times 4\frac{1}{4} \times 3\frac{1}{2}}{100} = £201 \text{ os. } 7\tfrac{1}{2}\text{d. Ans.}$$

STANDARD VII.

(1) If 750 yards of silk cost £980 and a gain of 20 per cent. be made, what is the selling price of 1 yd.?

£980 + 20 p.c. of £980 = £1176.
£1176 ÷ 750 = £1 11s. 4⅘d. Ans.

(2) I pay 14s. 7½d. for the carriage of 4½ cwt. for 125 miles, what should I pay for the carriage of 26 cwt. 2 qr. for 30 miles?

Cwt. 4½ : 26½ :: 14s. 7½d. : £1 os. 8⅗d. Ans.
125 : 30

(3) Find the average of all the nos. ending in 9 from 100 to 200.

(109+119+129+139+149+159+169+179+189 +199) ÷ 10 = 154. Ans.

(4) If the population of a town increases from 56,725 to 69,326 in 10 years what will be the population in another 10 years?

Gain on 56,725 = 12,601
" " 69,326 = 15,400+
Total population = 84,726+. Ans.

(5) I bought coals for 10s. 6d., and sold them at a profit of 12½ per cent. What was the selling price?

100 : 112½ :: 10s. 6d. : s. p.
= 8 : 9 :: 10s. 6d.
= 1s. 3¾d. × 9 = 11s. 9¾d. Ans.

(6) A bankrupt owed £725, and his estate yielded only £475, what percentage of their money did his creditors lose?

£725 − £475 = £250.

£	£
Loss on 725	= 250
" " 1	= 250/725
" " 100	= 250 × 100 / 725

$$= \frac{250 \times 100}{\underset{29}{\cancel{725}}} = \frac{1000}{29} = 34\tfrac{14}{29}\text{d. Ans.}$$

Music.

TONIC SOL-FA NOTATION.

DIVISION II. (STANDARDS I.-II.)

SIGHT TEST.

(Sing to Two-pulse Measure.)

‖ d m s l s m d d¹ m r d s m f s l t d¹ m r d ‖

TIME TEST.

| 1 : — : 1 | 1 : 1 : — | 1 : : 1 | 1 : — : 1 ‖.

DIVISION III. (STANDARDS III.-IV.)

SIGHT TEST.

(Sing to Two-pulse Measure.)

‖m s d m r d m s fe s f r l s m d d¹ t, l t d m r l s t d¹.

TIME TEST.

| 1 : 1 | 1.1 : 1 | 1 : — | — : 1.1 | 1 : | : 1 | 1 : — | : 1 ‖

—o—

Popular Mythology.

BY THE REV. SIR GEORGE W. COX, BART., M.A.,
Author of 'Tales of Ancient Greece,' 'Mythology of the Aryan Nations,' etc.

[These papers are designed for our youngest readers. Used as themes for composition work, they will be found invaluable.]

II.

Agamêdes and *Trophonios* are said to have been sons of the sun-god Apollo, who endowed them with marvellous skill as builders. They built his shrine at Delphi, and a treasury for King Hyrieus. This treasury they constantly robbed, until the king set a trap in which Agamedes was caught. Trophonios swept off his head, and was himself swallowed up by the earth. We find the substance of this legend in the 'Arabian Nights' story of 'Ali Baba and the Forty Thieves,' and also in the tale of the Master Thief.

Agamemnon is the supreme leader of the Achaians in the enterprise undertaken to rescue Helen from Troy. He was himself king of all Argos and of the neighbouring islands, and brother of Menelaos, king of Sparta, the husband of Helen. But in the Trojan war his glory is eclipsed by that of *Achilleus*. His doom was brought about by the sacrifice of his daughter Iphigeneia, whom he allowed to be slain in Aulis, as an offering to the offended goddess Artemis, who, by sending contrary winds, prevented the army from crossing the Egean sea. After the fall of Ilion, his wife Clytemnestra received him at Argos with a splendour which called forth his rebuke; but her mind was set only upon vengeance for the death of her child at Aulis. Agamemnon was ushered into the bath, and there he was smitten by the axe of Aigisthos, like a wild bull in a net. This deed roused the wrath of Atê, the goddess who broods over houses until the penalty for bloodshedding has been paid. Driven by this Atê Orestes avenged the slaughter of Agamemnon by smiting his mother Clytemnestra, and then the Erinyes gave him no peace until Athênê rescued him from their clutches in her court on Areiopagos, the Areopagus of Athens. This terrible story forms the subject of the great Trilogy, or three connected dramas, of Æschylus, called 'Agamemnon, Choephoroi, Eumenides.'

Ages, The.—In the poem known as the 'Theogony of Hesiod' the existence of men on the earth began with a Golden age, during which sicknesses were unknown, and the earth yielded her fruits without tillage. To these men death came as a gentle sleep, and they became the guardians of the good and the punishers of evil-doers. This happy time was followed by the Silver age, in which men incurred the wrath of the gods for withholding the honours due to them; but these also at their death were, nevertheless, reckoned among the blessed. The next age was the Brazen, in which men ate no corn and had hearts hard as adamant. These fought with and slew each other, and went down to the under world. The last age was the age of Iron, in which the men of the poet's own day were living—the age of care, of suffering, and of toil, which was to last so long as man continued to live upon the earth. But the vast mass of epical or popular stories told the exploits of men who clearly did not belong to either of the three preceding ages, and who were also immeasurably beyond the living race of men in strength of will and of body. It was necessary, therefore, to insert a fifth age, between the ages of Brass and of Iron; and this was called the Heroic age, the time of all the heroes, whose mighty deeds were sung by the Rhapsodists, or Bards.

This tradition of a series of ages, beginning with an age of Gold, is, we shall see, absolutely inconsistent and irreconcileable with the story of *Prometheus*.

Agni, in Hindu mythology, the god of fire. He is called the child of two sticks rubbed together; and being fed with oil and butter, he is said to have devoured his parents. He is puny and limping at his birth; black-backed and many-limbed; his hair flashes with flames which roar like the waves of the sea. He moves onwards with ever-flickering tongues, leaving a blackened path behind him. He is the messenger of the gods, carrying up to heaven the sacrifices offered to them by their worshippers on earth. He eats everything that comes in his way, and scathes the forests with his tongue, shearing off the hair of the earth as with a razor; but he also burns gently on the hearth, and so he is the lord and protector of every house, and the father, mother, brother, and son of every one of the worshippers.

All this is quite transparent, and we see here the root of the notions, which grew into the traditions of the maimed and limping fire-gods—Hephaistos, Vulcan, Loki, and Wayland the Smith, who is brought into Sir Walter Scott's novel of 'Kenilworth.'

In the Hindu poems and hymns Agni never grows old, and is always the youngest of the gods, as coming into life whenever the sticks are rubbed into flame. His name reappears in the Latin and Lithuanian words for fire (*ignis, agni*); but no stories under this name sprang up in the west.

Ahi, in the Vedic hymns of ancient India, is the throttling, choking, or strangling snake of darkness, the great enemy of the sun-god Indra, by whose spear he is after a dreadful conflict smitten down. The name, which is used also as a symbol for sin, which throttles or strangles the soul of man, reappears in that of the Greek Echidna, the snake which steals the cattle of Herakles, and hides them away in her dark cave, as Ahi steals the cattle of Indra. The word contains the root from which we get the words *anguish, anchor, hang*, and many more.

Ahriman, in the Zoroastria enthology of Persia, is

the spirit of darkness, the great enemy of Ormuzd, the spirit of light and goodness. The Persian form of Ahriman is Angro-mainyus, or Ormuzd Ahuro-mazdao, which corresponds to the Indian Asuro-medhas, or wise spirit, the name Asuro being the same as that of the Æsir. The exaltation of Ormuzd in the Persian belief, as the supreme and righteous God, carried the greatness of Ahriman to a pitch which made him the creator of an evil universe at war with the Kosmos of the spirit of light.

In the west, Ahriman, as a name for the devil, survives in the slang phrase 'Old Harry.'

(*To be continued.*)

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Chemistry of the Non-Metallics.

[This series of articles, whilst dealing with the subjects required by the University of London for the Matriculation Examination and with those required at the Elementary Stage of the Inorganic Chemistry (Branch X.) Science and Art Department, is intended as a practical guide to the philosophical and systematic study of the non-metallics.]

CHAPTER XIV.

COMPOUNDS OF CARBON AND HYDROGEN. FIRE, CANDLE, GAS.

Methane, light carburetted hydrogen, marsh gas.

a. H^4C. As this compound approaches the so-called organic bodies, it is usual to write its symbol as their symbols are written with the C first, CH^4.

b. 16.

c. FIRST PREPARATION.—From vegetable matter.

The decomposition of plants yields this gas. Two of the elements in plants are carbon and hydrogen, and these unite to form light carburetted hydrogen.

SECOND PREPARATION.—From sodium acetate and caustic soda.

1. Mix sodium acetate with soda-lime (a mixture of soda and lime), 1 part to 3. Place the mixture in a retort coated with clay, or in an iron barrel, closed at one end. Arrange a delivery tube and pneumatic trough with gas-jars. Heat the vessel containing the mixture strongly (in the gas furnace, if an iron vessel is used). Sodium carbonate and methane are formed. The latter is caught over water or by upward displacement of air, as the gas is lighter than air. Take care not to let the escaping gas come near a light.

2. $NC_2H_3O_2 + NaHO = Na_2CO_3 + CH_4$
3. 82 + 40 = 106 + 16
2 vols.

d. 1. Gas, very difficult to liquefy.

2. Without taste, odour, or colour.

3. 8 or $\frac{8}{14{\cdot}47}$

4. Slightly soluble: 100 cc. of water dissolve 5·4 cc. of methane.

5. Combustible, forming carbon dioxide and steam. Its flame is not very light-giving. It is the fire-damp of mines.

$$CH^4 + 2O_2 = CO^2 + 2H^2O$$
16 + 64 = 44 + 36
2 vols. 4 vols. 2 vols. 4 vols.

6. An inert gas, not uniting readily with anything but oxygen. Chlorine acts upon it by replacing atom after atom of hydrogen. The resulting gases have formulæ CH_3Cl, CH_2Cl_2, $CHCl_3$ (chloroform), CCl_4.

Ethene, heavy carburetted hydrogen. Olefiant gas.

a. C^2H^4.

b. 28.

c. PREPARATION.—From alcohol.

1. Arrange apparatus as in Fig. 39. Place 1 part of alcohol, 4 of strong sulphuric acid, and some coarse sand in the flask represented to the left in the figure. In the

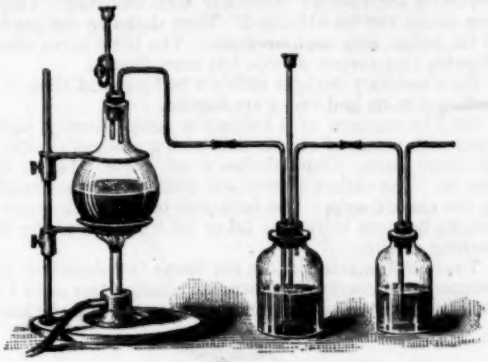


Fig. 39.

other two washing-bottles place pumice-stone and soda, and pumice-stone and sulphuric acid respectively. These absorb the carbon dioxide and any alcoholic vapour that is likely to come off. Apply heat to the flask containing the alcohol and sulphuric acid. The former yields water to the latter, and gives off ethene. This is caught over water in the pneumatic trough, or by upward displacement of air.

2. $C^2H^6O = C^2H^4 + H^2O$
46 = 28 + 18
2 vols.

d. 1. Gas: liquefying under strong pressure, at −110°.

2. With characteristic odour, known as that which belongs to the gas burnt in houses, and possibly due to the presence of ether. Colourless.

3. 14 or $\frac{14}{14{\cdot}47}$

4. Scarcely soluble at all in water.

5. Combustible, forming carbon dioxide and steam. It gives out much light in burning, as the carbon it contains is rendered white hot by combustion, the heat given out in the combustion of the hydrogen. The heat of combustion of hydrogen = 34,462.

$$C^2H^4 + 3O_2 = 2CO^2 + 2H^2O$$
28 + 96 = 88 + 36
2 vols. 6 vols. 4 vols. 4 vols.

6. The chief constituent of the gas at present used for purposes of illumination.

Now that these two compounds of carbon and hydrogen, and the products, carbon dioxide and hydrogen oxide, formed by their combustion, have been dealt with, we may consider the actions that take place in fires and in arrangements for the supply of heat.

One or two experiments should be performed here.

Take a wide-mouthed, flat-bottomed flask, and a deflagrating spoon, Fig. 40. Place in the former some lime-

Fig. 40.

water, and fix to the latter a small piece of candle. Light the candle and introduce it into the flask. It burns for a

little while, but presently, as all the oxygen of the air in the flask is used up, the candle goes out. Remove the deflagrating spoon and candle, and note that the sides of the bottle are covered internally with moisture. Therefore steam has been formed. Then shake up the gas left in the bottle with the lime-water. The latter turns white, showing that carbon dioxide has been formed.

Burn ordinary coal-gas within a bell-jar, and show that carbon dioxide and steam are formed.

Affix to one arm of a balance a lamp-chimney, partly filled with pieces of caustic soda with a piece of candle in its lower part. Counterbalance all these. Light the candle. The carbon dioxide and steam formed are caught by the caustic soda. The collection of things increases in weight, because oxygen is taken up from the air by the burning candle.

To show how artificial are our terms 'combustible' and 'supporter of combustion,' arrange a lamp-glass as in Fig. 41. Connect the upper tube with a gas jet and the lower

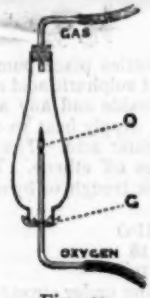


Fig. 41.

with an apparatus for supplying oxygen. The oxygen catches fire and burns in an atmosphere of coal-gas.

In an ordinary fire coal is burnt. This is a compound consisting mainly of carbon and hydrogen. Its hydrogen at once unites with oxygen to form steam. Its carbon unites with oxygen to form carbon dioxide. This gas passing over the red-hot coal of the h
of the fire, is reduced to the condition of igher regions The carbon oxide reaching oxygen again carbon oxide. most regions of the fire, forms carbon d in the upper- changes can be shown in symbols thus— ioxide. These

$$C + O^2 = CO^2$$
$$12 + 32 = 44$$
2 vols. 2 vols.
$$CO^2 + C = 2CO$$
$$44 + 12 = 56$$
2 vols. 4 vols.
$$2CO + O = 2CO^2$$
$$56 + 32 = 88$$
4 vols. 2 vols. 4 vols.

In a candle-flame (Fig. 42) three regions are distinguishable. The centre is dark. This contains gases, the result

Fig. 42.

of the volatilisation of the tallow or wax of the candle. This *area of no combustion* is surrounded by a luminous area, where the hydrogen is burning and the carbon is being rendered white-hot. This is the *area of partial combustion.* Outside is a region where the luminosity is feeble and ultimately vanishes, but the heat is great. In this *area of complete combustion* both the hydrogen and carbon are burning.

These facts are further shown by the following experiments. Pass a piece of wire gauze down on a flame and look at it from above. A central dark space is visible, with a circling ring of flame.

Carry off the unburnt gases from the central part by means of a piece of quill tubing, some four inches long, and burn them at the other end of the tubing.

Lower into the flame a piece of platinum wire held horizontally. In the upper part of the flame it is red throughout the part that is in the flame. Lower down it is dark in the centre and red at the sides.

Examples on the Compounds of Carbon and Hydrogen.

(*Solved.*)

99. A mixture of 8 grams of marsh gas and 14 of olefiant gas is to be formed. What substances will be required, and what weight of each?

16 grams CH^4 need 82 grams $NaC^2H^3O^2$ + 40 grams NaHO.
1 gram ,, needs $\frac{82}{16}$,, + $\frac{40}{16}$,,
8 grams ,, need $\frac{82 \times 8}{16}$,, + $\frac{40 \times 8}{16}$,,
= 41 grams $NaC^2H^3O^2$ and 20 grams NaHO.

28 grams C^2H^4 need 46 grams C^2H^6O
1 gram ,, needs $\frac{46}{28}$,,
14 grams ,, need $\frac{46 \times 14}{28}$,, = 23 grams C^2H^6O.

100. A litre of a mixture of methane and ethene is exploded. What volume of carbon dioxide is formed when the temperature and pressure are reduced to normal, if the relative quantities of the two hydrocarbons are equal?

2 vols. CH^4 form when burnt 2 vols. CO^2
1 vol. ,, ,, $\frac{2}{2}$,,
500 cc. ,, ,, $\frac{2 \times 500}{2}$,, = 500 cc.

2 vols. C^2H^4 ,, 4 ,,
1 vol. ,, ,, $\frac{4}{2}$,,
500 vols. ,, ,, $\frac{4 \times 500}{2}$,, = 1000 cc.

1500 cc.

Examples on the Compounds of Carbon and Hydrogen.

(*For solution.*)

97. What weight of caustic soda must be mixed with 200 grams of sodium acetate that, after heating, 36 grams of the acetate may be undecomposed? ..... 80 grams.

98. How many cc. of oxygen are necessary for the combustion of 100 cc. of marsh gas, and what volume of carbon dioxide will be formed? ..... 200 cc. CH^4, 100 cc. CO^2.

99. Required the weight of alcohol that must be decomposed to yield at a temperature of −130 and pressure 800 m.m. $10\frac{1}{2}$ litres of ethene? ..... 23 grams.

100. A quantity of ethene is burnt. After the combustion it is found that 80 grams of caustic soda are required to absorb the carbon dioxide formed. What was the volume of the ethene, and what weight of steam was produced at the same time?
..... 11·2 litres C^2H^4. 18 grams H^2O.

101. A mixture of 40 cc. of methane and 60 cc. of ethene has to be exploded. What volume of oxygen is necessary, and what volume of carbon dioxide will be formed?
..... 260 cc. and 160 cc.

102. 500 cc. of mixed ethene and methane are exploded. 900 cc. of carbon dioxide the result. What are the proportions of the two hydrocarbon gases? ..... 1/4.

(*To be continued.*)

Freehand Drawing Copy.

BY W. H. HARVEY, B.A. (LOND.).

THE BRAMBLE.

How to Teach Drawing in Elementary Schools.

BY T. R. ABLETT,

Superintendent of Drawing to the School Board for London.

DRAWING FROM MODELS.—V. CURVES.

THE drawing of the circle and ellipse have been first considered as being the easiest of the curves.

Fig. 10 goes a step further, in that it shows curves which turn in two directions, instead of being continuous, or, to use a mathematical expression, enclosed.

Fig. 10 shows curves drawn to fill a blackboard

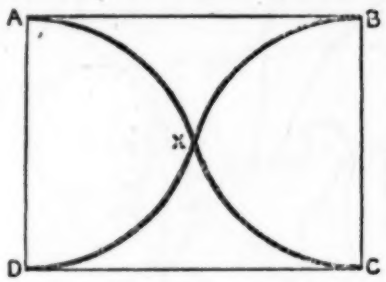


Fig. 10.

The outline of the board and the curves should first be drawn as a freehand copy, in order that the pupils may fully appreciate the fact that the four curves AX, BX, DX, and CX are precisely alike. This drawing need not be larger than 2 by 1½ inches. When the freehand drawing has been made, the blackboard should be placed below the level of the eye, as shown in Fig. 11, and the board should be

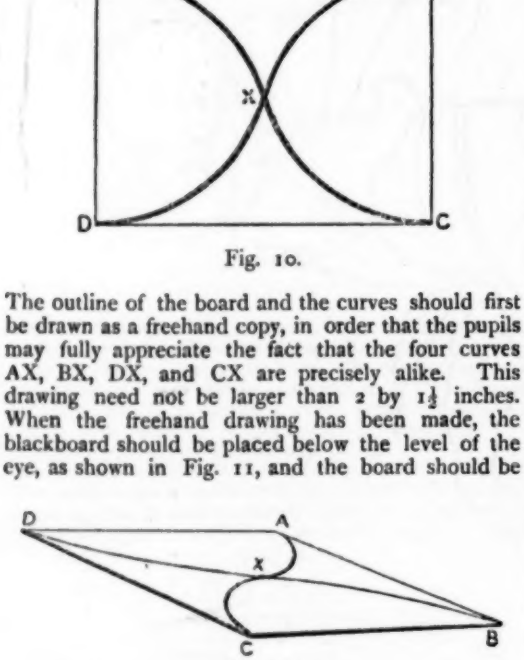


Fig. 11.

drawn as described in Fig. 10, of Article II. (Drawing from Models). When this has been satisfactorily done, the point X, where the diagonals intersect, should be marked.

Pupils should be directed to hold their pencils on the imaginary glass plane, interposed between them and the board (so that X and C will appear close to one edge of the pencil), and to notice the apparent curvature of the curve from X to C. In the same way they should hold the pencil between X and B, and notice the apparent curvature of that curve. The difference between the two will appear something like that shown in Fig. 11, if the blackboard is placed, and this is of great importance, with the diagonal AC running towards the centre of the class. Another important matter, in the arrangement of the relative position of the class and the model, is that the class should form a compact body of such a kind, that the pupils have nearly the same view of the object. This can be brought about by placing the model some distance to the extreme right or left-hand side, in front of the class.

When the pupils have drawn curves CX and XB, they should find out the apparent curvature of DX and AX, by using the pencil as described above. When the whole of the curves have been well drawn, the difference between those from D to X and X to B, compared with those from C to X and X to A, should be pointed out. The fact that the whole of the curves in Fig. 11 are unlike those in Fig. 10, should also be

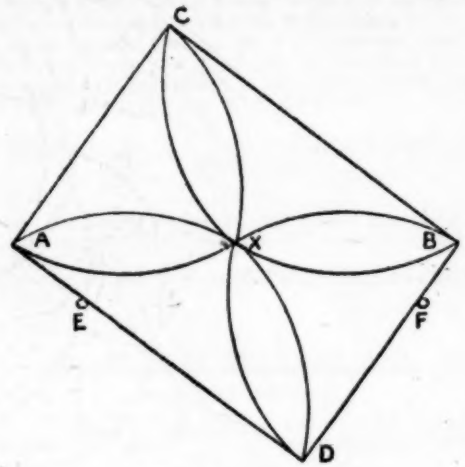


Fig. 12.

brought to the attention of the pupils. The drawing of curves as they appear, forms *the great difficulty* that draughtsmen have to overcome in learning their profession. I have invented this method of teaching to lessen that difficulty, and I know of no plan so likely to secure that result in elementary work.

It is not always possible to place a blackboard satisfactorily in the position indicated in Fig. 11.

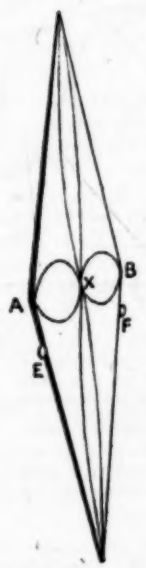


Fig. 13.

Another position is shown in Fig. 13, where the

blackboard is placed on an easel against a side wall in front of the class. The blackboard should be drawn as a freehand copy when placed in front of the class as in Fig. 12. The pegs of the easel are shown at E and F, so that one diagonal of the board is placed horizontally. When the board and easel are placed against the side wall, to give practice in model drawing, the pupils should be brought into a compact body as near that side wall as they can conveniently be placed, for those who sit at the other end of a long room, and especially those who sit in the front desk will have an almost front view of the blackboard, that is they will see it as shown in Fig. 12.

Fig. 14 will explain this. When the blackboard

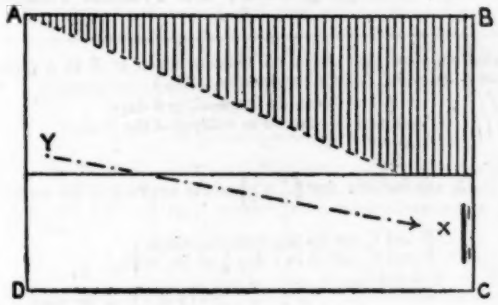


Fig. 14.

and easel are placed as at X, in the class-room ABCD, the pupils should sit only in that part of the room which is shaded, otherwise the teacher will be unable to give an effective demonstration to all. Any pupil sitting at Y, for instance, would practically have a front view of the blackboard. The difficulties already mentioned, of placing the board as in Fig 11, may be overcome as shown in Fig. 15. A blackboard is

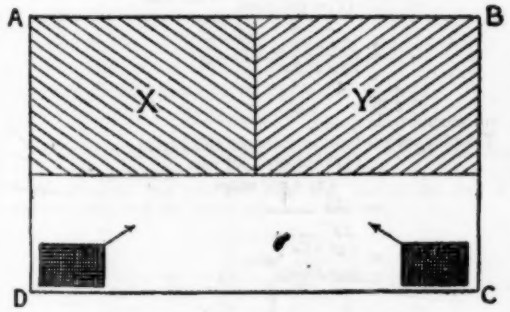


Fig. 15.

placed in each of the corners, D and C, of the class-room ABCD. The pupils who sit in that half of the room marked X, should draw from the board at C, and those who sit at Y from the board at D. Both boards may have on them the same curves, or one may have a set of curves of greater difficulty than the other, to suit the capacity of the better drawers.

Instead of the blackboard being placed in the positions indicated in Fig. 11 and Fig. 13, it may be placed as in Fig. 17, that is, horizontally, but above the level of the eye. This can be managed by placing two easels of the same height side by side, and placing the blackboard horizontally on the top of them. The curves would in this case be on the under-side of the blackboard as shown in Fig 17. For this purpose they must be drawn very distinctly in black on a sheet of paper as large as the blackboard. The drawing of

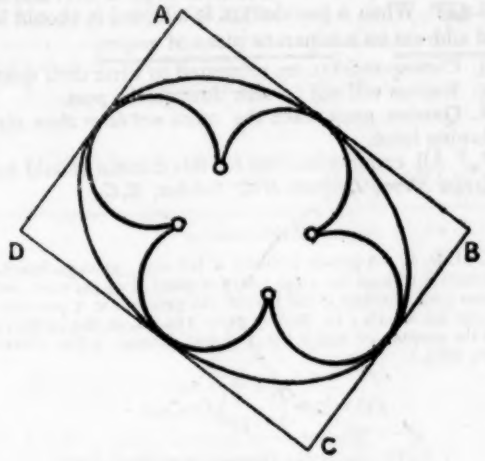


Fig. 16.

these curves is by no means an easy exercise, though it is considerably easier than the drawing of the handle of a flat-iron or of a dust-pan, both of which objects have been given in the first grade examinations.

The advantage of drawing large curves such as fill a blackboard, is that the pencil can be effectively used when held between the eye and the object. It is impossible to gain any help from the pencil, if the ob-

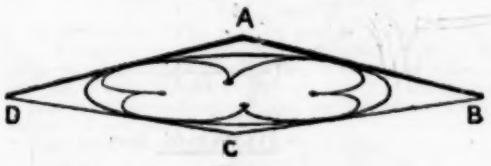


Fig. 17.

ject is small, like a flat-iron, or cup and saucer, and placed at a considerable distance from the child who is drawing.

In these articles on model drawing, I have dealt with that part of it which can be the most successfully taught in an ordinary class-room. Teachers make a great mistake, who give instruction only in the kind of work that will be given in the examination. It is far easier to teach the principles from large objects than from small ones. Pupils who have learned their model drawing merely from cubes, cones, prisms, and cylinders, entirely fail to grasp the mere rudiments of the subject. This I have ascertained by practical tests over and over again.

The next article will deal with the teaching of freehand.

(To be continued.)

Query Column.

RULES.

1. Each correspondent is restricted to *one question.* We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

Arithmetic.

1. M. R. S.—A person holding a bill due 30 days hence, discounts it without the usual 3 days of grace at 4½ per cent. per annum (true discount), and invests the proceeds at 5 per cent. interest per annum; he thereby gains 11s. 3d. in the 30 days; find the amount for which the bill was drawn. (*Men Clerkships*, 1885.)

$$£4\tfrac{1}{2} \times \frac{30}{365} = \left(\frac{9}{200} \times \frac{3}{73}\right)£ = £\frac{27}{1460};$$

$$\therefore \underset{£}{100\tfrac{27}{1460}} : \underset{£}{100} :: \underset{£}{\tfrac{27}{1460}} : \text{Discount on a bill of } £100 = \underline{£\tfrac{27}{1460}}.$$

$$\text{Present worth} = £100 - £\tfrac{27}{1460} = \underline{£\tfrac{14573}{1460}}.$$

$$\text{Interest on present worth} = \left(\frac{7306}{7327} \times \frac{1}{20} \times \frac{30}{365}\right)£ = \underline{\tfrac{3}{1460}£}.$$

$$\text{Gain} = £\tfrac{3}{1460} - £\tfrac{27}{1460} = \underline{£\tfrac{3}{146}}.$$

$$\therefore \underset{£}{\tfrac{3}{1460}} : \underset{£}{\tfrac{3}{146}} :: \underset{£}{100} : \text{Amount of bill} = 15$$

$$= \left(\frac{365}{365} \times \frac{7327}{365}\right)£ = 8\tfrac{1207}{365}£ = \underline{£13,738\ 2s.\ 6d.}\ \text{Ans.}$$

2. Dale.—A boy starts running in a straight line, and he runs four minutes. A man, who runs ½ faster than the boy, goes in pursuit; in what time will he overtake the boy?

The man will overtake the boy in (4 × 3) min.
= 12 min. Ans.

3. Gentil.—A, B, and C start at the same time from the same spot, and in the same direction round an island 70 miles in circumference. A goes at the rate of 15 miles, B 17, and C 19 miles per day. In what time will they be all together again?

In 70 days A will have gone round 15 times
" " B " " " 17 "
" " C " " " 19 "
In 35 " A " " " 7½ "
" " B " " " 8½ "
" " C " " " 9½ "
∴ They will be all together again in 35 days. Ans.

4. Rexton.—A and B can do a piece of work in 6 days, B and C in 9 days. In what time can A and C do the same, it being supposed that A can do twice as much as B in a given time? (*Oxford Local Examination*, 1884.)

A and B can do the work in 6 days,
∴ A and B can do in 1 day ⅙ of the work,
∴ A and ⅔ A " " " "
⅔ A " " "

$$\therefore \text{A can do in 1 day } \left(\frac{1}{6} \times \frac{2}{3}\right) \text{ of the work} = \tfrac{1}{9} \text{ of the work};$$

B and C can do the work in 9 days,
∴ B and C can do in 1 day ⅑ of the work,
∴ ⅓ A and C " " " " "
∴ C " " " {⅑ − (⅓ of ⅙)} of the work
= 1/18 of the work;
∴ A and C can do in one day (⅙ + 1/18) of the work
= ⅓ of the work.
∴ A and C can do the work in 6 days. Ans.

5. Ignoramus.—Three trains, 200, 528, 130 yards long, are travelling on parallel lines at rates of 15, 24, and 30 miles per hour respectively, the first two in the same direction, the third meeting them; the second reaches the rear of the first train at the same moment as the third reaches its front. Find the interval in time between the moments when each of the two trains clear the third. (*Certificate*, 1884.)

Time for first train to clear the third train
$$= \frac{(200+130)\text{ yds.}}{(15+30)\text{ miles}} \text{ of an hour} = \frac{\overset{3}{\cancel{330}} \times \overset{4}{\cancel{660}}}{\underset{3}{\cancel{45}} \times \underset{4}{\cancel{1760}}} \text{ min.} = \tfrac{1}{4} \text{ min.}$$

Time for second train to clear the third train
$$= \frac{(528+200+130)\text{ yds.}}{(24+30)\text{ miles}} \text{ of an hour} = \frac{\overset{3}{\cancel{858}} \times \overset{4}{\cancel{660}}}{\underset{3}{\cancel{54}} \times \underset{4}{\cancel{1760}}} \text{ min.} = 1\tfrac{1}{4} \text{ min.}$$

∴ Interval = (1¼ − ¼) min.
= 1 min.
= 1¼ sec. Ans.

6. M. A.—What must be added to ·324 to produce 3·01472?

3·01472
·324
2·69072. Ans.

$$2\cdot690\dot{7}\dot{2} = 2\frac{69072 - 690}{99000} = 2\tfrac{\overset{3}{\cancel{68382}}}{\underset{11}{\cancel{99000}}} = 2\tfrac{3798}{5500} = \underline{2\tfrac{1899}{2750}}.\ \text{Ans.}$$

7. CHER.—If a watch showing correct time on Tuesday at noon gains 3 min. 4 sec. in 24 hours, what is the correct time on the following Saturday evening when it is 10 o'clock by the watch? (*Ricks.*)

Time from noon on Tuesday until 10 p.m. on Saturday
$= 4$ days 10 hrs.;
Time gained $= 3$ min. 4 sec. $\times 4\frac{5}{11}$
$= 12$ min. 16 sec. $+ 1$ min. $16\frac{4}{11}$ sec.
$= 13$ min. $32\frac{4}{11}$ sec.;
$\therefore$ Correct time $= (60$ min. $- 13$ min. $32\frac{4}{11}$ sec.) past 9
$= 46$ min. $27\frac{7}{11}$ sec. past 9. Ans.

8. LE TIEN.—A watch which loses 5 sec. in 5 min. is set right at 8 a.m. What will be the correct time when the hands are together between 4 and 5 o'clock in the afternoon? (*Ricks.*)

Hands of the watch are together at
(20 min. $+ \frac{1}{11}$ of 20 min.) past 4
$= 21\frac{9}{11}$ min. past 4;
Time from 8 a.m. to $21\frac{9}{11}$ min. past 4 p.m.
$= 8$ hrs. $21\frac{9}{11}$ min.;
Time lost $= \frac{1}{60}$ of 8 hrs. $21\frac{9}{11}$ min.
$= 8\frac{4}{11}$ min.;
$\therefore$ Correct time $= (21\frac{9}{11}$ min. $+ 8\frac{4}{11}$ min.) past 4
$= 30\frac{2}{11}$ min. past 4
$= 30$ min. $10\frac{10}{11}$ sec. past 4. Ans.

9. A. T. S. C.—What is the difference between the true discount and the interest on a debt of £325, which ought to have been paid 9 months ago, reckoning the value of money at $7\frac{1}{2}$ per cent.?

$£7\frac{1}{2} \times \frac{3}{4} = (\frac{15}{2} \times \frac{3}{4})£ = \frac{45}{8}$ £ $= 5\frac{5}{8}$;

£ £ £
$\therefore$ $105\frac{5}{8} : 325 :: 5\frac{5}{8}$: Discount.
8 8
845 25 45
169 9 9
13 | 225
£17 6s. $1\frac{1}{13}$d.

£ £ £
$\therefore$ 100 : 325 :: $5\frac{5}{8}$: Interest.
$5\frac{5}{8}$
1625
203 2s. 6d.
£18.28 2s. 6d.
20
s. 5.62
12
d. 7.50

$\therefore$ Interest = £18 5s. $7\frac{1}{2}$d.

$\therefore$ Difference = £18 5s. $7\frac{1}{2}$d. $-$ £17 6s. $1\frac{1}{13}$d.
= 19s. $5\frac{6}{13}$d. Ans.

10. B. A.—A tradesman sells goods either for cash—allowing 5 per cent. discount—or at 6 months' credit. If I buy £50 worth of goods, and pay half now and half at the end of 6 months, what will the goods cost me? (*Ricks.*)

$£5 \times \frac{1}{2} = £2\frac{1}{2}$;

£ £ £
$\therefore$ $102\frac{1}{2} : 25 :: 100$: Ready-money payment.
2 2
205 50
41 | 1000
£24 7s. $9\frac{9}{41}$d.

$\therefore$ Cost of goods = £25 + £24 7s. $9\frac{9}{41}$d.
= £49 7s. $9\frac{9}{41}$d. Ans.

11. R. A. M.—A merchant imports a cargo of wood from Russia, valued at 5400 roubles. He may order the sum to be drawn directly at 37d. per rouble, or on Holland at 1 florin 85 cents per rouble, and from Holland to London at 11 florins 95 cents per £; find the cheaper method.
(1 florin = 100 cents).

Direct payment = 37d. $\times$ 5400
$= (37 \times 450)$s.
$= (37 \times 22\frac{1}{2})£$
$= £832$ 10s.

Payment by Holland $= \frac{5400 \times 1{\cdot}85}{11{\cdot}95}£$
$= \frac{5400 \times 37}{239}£$
$= \frac{1999800}{239}£$
$= £835$ 19s. $7\frac{217}{239}$d.

$\therefore$ Cheaper method is direct payment, and difference
= £835 19s. $7\frac{217}{239}$d. $-$ £832 10s.
= £3 9s. $7\frac{217}{239}$d.

12. H. GOLLAND.—If rabbits cost 4d., linnets $\frac{1}{2}$d., and sparrows $\frac{1}{4}$d., and I buy altogether 20 of these for 20d., how many of each shall I receive?

Average price = 20d. $\div$ 20 = 1d.;
Difference between price of rabbits and average price = 4d. $-$ 1d.
= 3d.;
Difference between price of linnets and average price = 1d. $-\frac{1}{2}$d.
= $\frac{1}{2}$d.;
Difference between price of sparrows and average price = 1d. $-\frac{1}{4}$d.
= $\frac{3}{4}$d.;
(For 1st difference)
No. of rabbits : No. of linnets :: $\frac{1}{2}$d. : 3d.
:: 1 : 6;
(For 2nd difference)
No. of linnets : No. of sparrows :: $\frac{3}{4}$d. : $\frac{1}{2}$d.
:: 3 : 2;
For 1 rabbit there can be 6 linnets,
" 3 rabbits " " 18 " ;
$3 + 18 = 21$;
And for 3 linnets there can be 2 sparrows;
$\therefore$ Nos. = 3 rabbits, 15 linnets, 2 sparrows.

Note.—The solution of the first query appeared in our issue for April, 1884.

13. STUDENT.—A's present age is to B's present age as 8 : 7; 27 years ago their ages were as 5 : 4. Find B's age.

A's age $= \frac{8}{7}$ B's age;
$\therefore$ $\frac{8}{7}$ B's age $- 27$ years $= \frac{5}{4}$ (B's age $- 27$ years)
$= \frac{5}{4}$ B's age $- \frac{5}{4}$ of 27 years,
$\frac{5}{4}$ B's age $- \frac{8}{7}$ B's age $= 1\frac{1}{28}$ years $- 27$ years,
$\frac{35-32}{28}$ B's age $= \frac{135-108}{4}$ years,
$\frac{3}{28}$ B's age $= \frac{27}{4}$ years,
$\therefore$ B's age $= \left(\frac{\cancel{27}}{\cancel{4}} \times \frac{\cancel{28}}{\cancel{3}}\right)$ years
$= 63$ years. Ans.

14. ASTYANAX.—The price of gold is £3 17s. $10\frac{1}{2}$d. per oz.. A composition of gold and silver weighing 18 lbs. is worth £637 7s.; but if the proportions of gold and silver were interchanged, it would be worth only £259 1s. Find the proportion of gold and silver in the composition, and the price of silver per ounce. (*Brook Smith.*)

Value of 18 lbs. of gold and 18 lbs. of silver
= £637 7s. $+$ £259 1s.
= £896 8s.;
But value of 18 lbs. of gold = £3 17s. $10\frac{1}{2}$d. $\times 12 \times 18$
= £841 1s.;
$\therefore$ Value of 18 lbs. of silver = £896 8s. $-$ £841 1s.
= £55 7s.;
$\therefore$ Price of silver per ounce = £55 7s. $\div 216$
= 5s. $1\frac{1}{2}$d. Ans.

Difference between value of an oz. of gold and an oz. of silver
= £3 17s. $10\frac{1}{2}$d. $-$ 5s. $1\frac{1}{2}$d.
= £3 12s. 9d.;
Difference between value of 18 lbs. of gold and value of composition = £841 1s. $-$ £637 7s.
= £203 14s.;
$\therefore$ Quantity of silver in composition $= \frac{£203\ 14s.}{£3\ 12s.\ 9d.}$ oz.
$= \frac{16296}{291}$ oz.
$= 56$ oz.;
And quantity of gold in composition $= (216 - 56)$ oz.
$= 160$ oz.;
$\therefore$ Gold in composition : silver in composition
:: 160 oz. : 56 oz.
:: 20 : 7. Ans.

15. THANKFUL.—I have to earn a certain sum of money by selling a certain number of nuts, and I find that if I sell at the rate of 40 a penny I shall earn 10 pence too much; if at 50 a penny, 5 pence too little. How many have I to sell? (*Brook Smith.*)

No. of nuts obtained for 10d. at former rate = 400
" " 5d. at latter " = 250
650

Difference in rates = 10 a penny;
∴ Amount to be earned = $\frac{5\times10}{10}$d.
= 65d.;
∴ No. of nuts to be sold = 40 × (65 + 10)
= 40 × 75
= 3000. Ans.

16. FOLKESTONIAN.—A builder contracted to build a house in 12 weeks, and agreed to pay £5 for each day, or part of a day, that the work remained incomplete after the end of that period. To fulfil his contract he engaged 15 men to work 10 hours a day; at the end of three weeks ten of the men struck, and remained away from their work for a fortnight; after their return the number of hours was reduced to 9. What was due from the contractor?

Part done in 3 weeks = $\frac{3}{12}=\frac{1}{4}$;
" next 2 weeks = $\frac{f}{fg}$ of $\frac{1}{fz}\times\frac{z}{1}$
$\frac{3}{6}$
$=\frac{1}{12}$;
∴ Remainder of work = $\frac{3}{4}-\frac{1}{12}$
$=\frac{27-2}{36}$
$=\frac{25}{36}$;
3
Part done in a week after strike = $\frac{g}{10}$ of $\frac{1}{fz}$
4
$=\frac{1}{40}$;
∴ Time to complete the work = $(\frac{25}{36}\div\frac{1}{40})$ wks.
10
$=\left(\frac{25}{36}\times\frac{40}{3}\right)$ wks.
9
$=\frac{250}{27}$ wks.
$=9\frac{7}{27}$ wks.;
∴ Total time = $(3+2+9\frac{7}{27})$ wks.;
$=14\frac{7}{27}$ weeks;
Amount to be paid for = $2\frac{7}{27}$ wks.;
∴ Amount due from contractor = (5 × 16) £
= £80. Ans.

Algebra.

1. P. P.—Solve the equation:—

$$\frac{a}{x-b}+\frac{b}{x-a}-\frac{2(a+b)}{2x+a+b}=0.$$

(*Intermediate Arts*, 1885.)

$$\frac{a}{x-b}+\frac{b}{x-a}-\frac{2(a+b)}{2x+a+b}=0$$

$$\frac{ax-a^2+bx-b^2}{(x-b)(x-a)}-\frac{2(a+b)}{2x+a+b}=0$$

$$\frac{(a+b)x-(a^2+b^2)}{x^2-(a+b)x+ab}-\frac{2(a+b)}{2x+a+b}=0$$

$$x(a+b)(2x+a+b)-(a^2+b^2)(2x+a+b)-2(a+b)\{x^2-(a+b)x+ab\}=0$$

$$2x^2(a+b)+x(a+b)^2-2x(a^2+b^2)-(a+b)(a^2+b^2)-2x^2(a+b)+2x(a+b)^2-2ab(a+b)=0$$

$$3x(a+b)^2-2x(a^2+b^2)=(a+b)(a^2+b^2)+2ab(a+b)$$

$$3x(a^2+2ab+b^2)-2x(a^2+b^2)=(a+b)(a^2+2ab+b^2)$$

$$x(a^2+6ab+b^2)=(a+b)(a+b)^2$$

$$=(a+b)^3$$

$$\therefore x=\frac{(a+b)^3}{a^2+6ab+b^2}.$$

2. MARK TWAIN.—Divide the numbers 80 and 90, each into two parts, so that the sum of one out of each pair may be 100, and the difference of the others 30. (*Colenso.*)

Let x = One part of 80,
and " y = " " 90;
Then, (*a*) (1) $x+y=100$
(2) $(80-x)-(90-y)=30$
(2) $80-x-90+y=30$
$-x+y-10=30$
$-x+y=40$
(1) $x+y=100$
Adding $2y=140$
$\therefore y=70.$

And $x=100-70$
$=30.$

∴ (*a*) Parts = 30 and 50;
70 and 20.

(*b*) (1) $x+y=100$
(2) $(90-y)-(80-x)=30$
(2) $90-y-80+x=30$
$x-y+10=30$
$x-y=20$
(1) $x+y=100$
Adding $2x=120$
$\therefore x=60.$

And $y=100-60$
$=40.$

∴ (*b*) Parts = 60 and 20;
40 and 50.

3. NOBODY.—A and B take shares in a concern to the amount altogether of £500. They sell out at par, A at the end of two years, B of eight, and each receives in capital and profit £297. How much did each embark? (*Colenso.*)

Let x = Amount A invested in pounds,
and " y = Rate of profit per cent. per annum in pounds;

Then, (1) $x+\frac{2xy}{100}=297$
(2) $(500)-x+\frac{8y(500-x)}{100}=297$

(1) $x+\frac{xy}{50}=297$
(2) $-x+40y-\frac{4xy}{50}=-203$

(1) $4x+\frac{4xy}{50}=1188$
(2) $-x+40y-\frac{4xy}{50}=-203$

Adding $3x+40y=985$
$40y=985-3x$
$\therefore y=\frac{985-3x}{40}.$

(1) $x+\frac{xy}{50}=297$

$$x+\left(\frac{985-3x}{40}\times\frac{x}{50}\right)=297$$

$$x+\frac{x(985-3x)}{2000}=297$$

$$2000x+985x-3x^2=594000$$

$$-3x^2+2985x=594000$$

$$x^2-995x=-198000$$

$$x^2-995x+(\tfrac{995}{2})^2=\tfrac{990025}{4}-198000$$

$$=\tfrac{990025}{4}$$

$$x-\tfrac{995}{2}=\pm\tfrac{495}{2}$$

$$x=\pm\tfrac{495}{2}+\tfrac{995}{2}$$

$\therefore x=720$, or 275.

∴ Amount invested by A = £275
" " " B = £225 Ans.

4. PUZZLED ONE.—Three flags are required to make a signal. How many signals can be made by 20 flags of 5 different colours there being 4 of each colour? (*Hamblin Smith.*)

No. of signals with 1 of a colour = 5. 4. 3
= 60;
" " " 2 " " = 3. 4. 5 (Two of one colour with one of the others will make 3 signals)
= 60;
" " " 3 " " = 5;
∴ No. of signals = 60 + 60 + 5
= 125. Ans.

5. LADY STUDENT.—Find the factor of the highest dimensions in x and y, which is common to $x^2 - y^2 + 2y - 1$ and $x^3 + x^2(y-1) - x(y^2+2y+1) - (y^3+y^2-y-1)$.

(*Intermediate Arts*, 1885.)

$$\begin{aligned} & x^2 - y^2 + 2y - 1 \\ &= x^2 - (y^2 - 2y + 1) \\ &= x^2 - (y-1)^2 \\ &= \{x + (y-1)\}\{x - (y-1)\} \\ &= \underline{(x+y-1)(x-y+1).} \end{aligned}$$

$$\begin{aligned} & x^3 + x^2(y-1) - x(y^2+2y+1) - (y^3+y^2-y-1) \\ &= x^2(x+y-1) - \{x(y^2+2y+1) + (y-1)(y^2+2y+1)\} \\ &= x^2(x+y-1) - (x+y-1)(y^2+2y+1) \\ &= (x+y-1)\{x^2 - (y^2+2y+1)\} \\ &= (x+y-1)\{x^2 - (y+1)^2\} \\ &= \underline{(x+y-1)(x+y+1)(x-y-1).} \end{aligned}$$

∴ Factor = $\underline{x+y-1.}$ Ans.

6. HORACE.—Solve :—

$$\left.\begin{aligned} x+y+z &= 11 \\ x^2+y^2+z^2 &= 49 \\ zy &= 3x(z-y) \end{aligned}\right\}$$

$$\left.\begin{aligned} (1)\quad x+y+z &= 11 \\ (2)\quad x^2+y^2+z^2 &= 49 \\ (3)\quad zy &= 3x(z-y) \end{aligned}\right\}$$

(1) Squared} $x^2+y^2+z^2+2xy+2xz+2yz = 121$
(2) $x^2+y^2+z^2 = 49$

Subtracting} $2xy+2xz+2yz = 72$
$xy+xz+yz = 36$

(3) $3xy-3xz+yz = 0$

Subtracting} $-2xy+4xz = 36$
$2xz-xy = 18$
$xz+xz-xy = 18$
$xz+x(z-y) = 18$

But, $x(z-y) = \frac{yz}{3}$ (3)

$$\therefore \quad xz + \frac{yz}{3} = 18$$
$$3xz + yz = 54$$
$$3xz = 54 - yz$$
$$\therefore \quad x = \underline{\frac{54-yz}{3z}}$$

(1) $x+y+z = 11$
$\therefore \quad \underline{x = 11 - (y+z).}$

$$\therefore \quad \frac{54-yz}{3z} = 11 - (y+z)$$
$$54 - yz = 33z - 3yz - 3z^2$$
$$3yz - yz = 33z - 3z^2 - 54$$
$$2yz = 33z - 3z^2 - 54$$
$$\therefore \quad y = \underline{\frac{33z - 3z^2 - 54}{2z}}$$

$$\therefore \quad x = \frac{54 - yz}{3z}$$
$$= \frac{54 - \left(\frac{33z - 3z^2 - 54}{2z} \times z\right)}{3z}$$
$$= \frac{108 - 33z + 3z^2 + 54}{6z}$$
$$= \frac{3z^2 - 33z + 162}{6z}$$
$$= \underline{\frac{z^2 - 11z + 54}{2z}}.$$

(3) $yz = 3x(z-y)$

$$\frac{33z - 3z^2 - 54}{2} = \frac{3(z^2 - 11z + 54)}{2x} \quad \left(z - \frac{33z - 3z^2 - 54}{2z}\right)$$

$$\frac{11z - z^2 - 18}{2} = \frac{(z^2 - 11z + 54)(5z^2 - 33z + 54)}{4z^2}$$

$$22z^3 - 2z^4 - 36z^2 = 5z^4 - 88z^3 + 687z^2 - 2376z + 2916$$
$$7z^4 - 110z^3 + 723z^2 - 2376z + 2916 = 0$$
$$(z-6)(7z^3 - 68z^2 + 315z - 486) = 0$$

∴ One value of z is obtained by putting $z - 6 = 0$
$\therefore \quad \underline{z = 6.}$

$$\therefore \quad x = \frac{z^2 - 11z + 54}{2z}$$
$$= \frac{36 - 66 + 54}{12}$$
$$= \frac{24}{12}$$
$$= \underline{2.}$$

$$\therefore \quad y = \frac{33z - 3z^2 - 54}{2z}$$
$$= \frac{198 - 108 - 54}{12}$$
$$= \frac{36}{12}$$
$$= \underline{3.}$$

$\therefore \quad \underline{x = 2,\ y = 3,\ z = 6.}$

7. RIDLEY, Horsley.—Prove that if
$2s = a+b+c$, $3S = a^2+b^2+c^2$,
$(S-2a^2)(S-2b^2) + (S-2b^2)(S-2c^2) + (S-2c^2)(S-2a^2)$
$= 16s(s-a)(s-b)(s-c)$.

(*Cambridge Local*, 1884.)

$$\begin{aligned} & (S-2a^2)(S-2b^2) + (S-2b^2)(S-2c^2) + (S-2c^2)(S-2a^2) \\ &= \left(\frac{a^2+b^2+c^2}{3} - 2a^2\right)\left(\frac{a^2+b^2+c^2}{3} - 2b^2\right) \\ &\quad + \left(\frac{a^2+b^2+c^2}{3} - 2b^2\right)\left(\frac{a^2+b^2+c^2}{3} - 2c^2\right) \\ &\quad + \left(\frac{a^2+b^2+c^2}{3} - 2c^2\right)\left(\frac{a^2+b^2+c^2}{3} - 2a^2\right) \\ &= \left(\frac{-5a^2+b^2+c^2}{3}\right)\left(\frac{a^2-5b^2+c^2}{3}\right) \\ &\quad + \left(\frac{a^2-5b^2+c^2}{3}\right)\left(\frac{a^2+b^2-5c^2}{3}\right) \\ &\quad + \left(\frac{a^2+b^2-5c^2}{3}\right)\left(\frac{-5a^2+b^2+c^2}{3}\right) \\ &= \tfrac{1}{9}(-5a^4 + 26a^2b^2 - 4a^2c^2 - 5b^4 - 4b^2c^2 + c^4 \\ &\quad + a^4 - 4a^2b^2 - 4a^2c^2 - 5b^4 + 26b^2c^2 - 5c^4 \\ &\quad - 5a^4 - 4a^2b^2 + 26a^2c^2 + b^4 - 4b^2c^2 - 5c^4) \\ &= \tfrac{1}{9}(-9a^4 + 18a^2b^2 + 18a^2c^2 - 9b^4 + 18b^2c^2 - 9c^4) \\ &= -(a^4 - 2a^2b^2 - 2a^2c^2 + b^4 - 2b^2c^2 + c^4) \\ &= -\{(a^4 + b^4 + c^4 - 2a^2b^2 - 2a^2c^2 + 2b^2c^2) - 4b^2c^2\} \\ &= -\{(a^2 - b^2 - c^2)^2 - 4b^2c^2\} \\ &= -\{a^2 - b^2 - c^2 + 2bc)(a^2 - b^2 - c^2 - 2bc)\} \\ &= -\{a^2 - (b^2 + 2bc + c^2)\}\{a^2 - (b^2 + 2b + c^2)\} \\ &= -\{a^2 - (b-c)^2\}\{a^2 - (b+c)^2\} \\ &= -(a+b-c)(a-b+c)(a+b+c)(a-b-c)\} \\ &= \{a+b-c)(a-b+c)(a+b+c)(-a+b+c) \\ &= \{(a+b+c) - 2c\}\{(a+b+c) - 2b\}(a+b+c)\{(a+b+c) - 2a\} \\ &= (2s-2c)(2s-2b) \times 2s(2s-2a) \\ &= 2s\{2(s-c) \times 2(s-b) \times 2(s-a)\} \\ &= \underline{16s(s-a)(s-b)(s-c).} \end{aligned}$$

8. GUILLAUME.—The number of permutations of m things taken 3 at a time : the number of permutations of $m+2$ things taken 3 at a time = 1 : 5. Find m. (*Hamblin Smith.*)

$$\begin{aligned} & m(m-1)(m-2) : (m+2)(m+1)m :: 1 : 5, \\ & (m-1)(m-2) : (m+1)(m+2) :: 1 : 5, \\ & \therefore \quad 5(m-1)(m-2) = (m+1)(m+2) \\ & 5(m^2 - 3m + 2) = m^2 + 3m + 2 \\ & 5m^2 - 15m + 10 = m^2 + 3m + 2 \\ & 4m^2 - 18m = -8 \\ & m^2 - \frac{9m}{2} = -2 \\ & m^2 - \frac{9m}{2} + \left(\frac{9}{4}\right)^2 = \frac{81}{16} - 2 \\ & = \frac{49}{16} \\ & m - \frac{9}{4} = \pm\frac{7}{4} \\ & m = \pm\frac{7}{4} + \frac{9}{4} \\ & = \underline{4,\ \text{or}\ \tfrac{1}{2}.} \end{aligned}$$

$\therefore \quad \underline{m = 4.}$ Ans.

9. BURRELL.—Given log 648 = 2·81157501, log 864 = 2·93651374, find log 3 and log 5. (*Todhunter.*)

$648 = 2^3 \times 3^4$;

$864 = 2^5 \times 3^3$;

$\therefore$ $3 \log 2 + 4 \log 3 = 2{\cdot}81157501$

$5 \log 2 + 3 \log 3 = 2{\cdot}93651374$

$15 \log 2 + 20 \log 3 = 14{\cdot}05787505$

$15 \log 2 + 9 \log 3 = 8{\cdot}80954122$

$11 \log 3 = 5{\cdot}24833383$

$\therefore$ $\log 3 = {\cdot}47712125$. Ans.

$9 \log 2 + 12 \log 3 = 8{\cdot}43472503$

$20 \log 2 + 12 \log 3 = 11{\cdot}74605496$

$11 \log 2 = 3{\cdot}31132993$

$\therefore$ $\log 2 = {\cdot}30102999$.

Then, $\log 5 = \log \frac{10}{2}$

$= \log 10 - \log 2$

$= 1 - {\cdot}30102999$

$= {\cdot}69897001$. Ans.

10. CYCLOPS.—If 40 minutes would be saved in a journey by increasing the rate of the train by 5 miles an hour, and one hour would be lost by diminishing it by the same amount, find the rate of the train, and the length of the journey. (*Harrow School Entrance Scholarships*, 1884.)

Let x = Rate of train per hour in miles,

and " y = Length of journey in miles;

Then, (1) $\frac{y}{x+5} = \frac{y}{x} - \frac{2}{3}$

(2) $\frac{y}{x-5} = \frac{y}{x} + 1$

(1) $\frac{y}{x} - \frac{y}{x+5} = \frac{2}{3}$

(2) $\frac{y}{x-5} - \frac{y}{x} = 1$

(1) $\frac{xy+5y-xy}{x(x+5)} = \frac{2}{3}$

(2) $\frac{xy-xy+5y}{x(x-5)} = 1$

(1) $\frac{5y}{x(x+5)} = \frac{2}{3}$

(2) $\frac{5y}{x(x-5)} = 1$

(1) ÷ (2) $\quad \frac{x-5}{x+5} = \frac{2}{3}$

$\frac{\text{Numerator + Denominator}}{\text{Denominator - Numerator}} \quad \frac{2x}{10} = \frac{5}{1}$

$\frac{x}{5} = 5$

$\therefore$ $x = 25$.

(2) $\frac{5y}{x(x-5)} = 1$

$\frac{5y}{25(25-5)} = 1$

$\therefore$ $y = 5 \times 20$

$= 100$.

$\therefore$ Rate = 25 miles an hour;

Journey = 100 miles.

11. C. S. KERRY.—Simplify:—

$$\frac{3}{8(1-x)} + \frac{1}{8(1+x)} - \frac{1-x}{4(1+x^2)}.$$

$$\frac{3}{8(1-x)} + \frac{1}{8(1+x)} - \frac{1-x}{4(1+x^2)}$$

L.C.M. $= 8(1-x)(1+x)(1+x^2)$

$= 8(1-x^2)(1+x^2)$

$= 8(1-x^4)$

$$= \frac{3(1+x)(1+x^2) + (1-x)(1+x^2) - 2(1-x)(1-x^2)}{8(1-x^4)}$$

$$= \frac{3(1+x+x^2+x^3) + 1 - x + x^2 - x^3 - 2(1-x-x^2+x^3)}{8(1-x^4)}$$

$$= \frac{3+3x+3x^2+3x^3+1-x+x^2-x^3-2+2x+2x^2-2x^3}{8(1-x^4)}$$

$$= \frac{2+4x+6x^2}{8(1-x^4)}$$

$$= \frac{1+2x+3x^2}{4(1-x^4)}.$$ Ans.

12. THANKFUL.—Find the sum of the squares of the first n natural numbers.

Let S denote the required sum, then

$S = 1^2 + 2^2 + 3^2 + \ldots\ldots + n^2$.

We have

$n^3 - (n-1)^3 = n^3 - (n^3 - 3n^2 + 3n - 1)$

$= 3n^2 - 3n + 1$;

$(n-1)^3 - (n-2)^3 = 3(n-1)^2 - 3(n-1) + 1$; (putting $(n-1)$ for n in No. 1)

$(n-2)^3 - (n-3)^3 = 3(n-2)^2 - 3(n-2) + 1$; (putting $(n-2)$ for n in No. 1)

.....

Similarly $\quad 3^3 - 2^3 = 3.3^2 - 3.3 + 1$; (putting 3 for n in No. 1)

$2^3 - 1^3 = 3.2^2 - 3.2 + 1$; (putting 2 for n in No. 1)

$1^3 - 0^3 = 3.1^2 - 3.1 + 1$; (putting 1 for n in No. 1)

Hence, by addition,

$n^3 = 3\{1^2 + 2^2 + 3^2 + \ldots\ldots + (n-2)^2 + (n-1)^2 + n^2\}$

$- 3\{1 + 2 + 3 + \ldots\ldots + (n-2) + (n-1) + n\} + (1 \times n)$

$= 3\{1^2 + 2^2 + 3^2 + \ldots\ldots + n^2\}$

$- 3\{1 + 2 + 3 + \ldots\ldots + n\} + n$

{But $1 + 2 + 3 + \ldots\ldots + n$ (Sum of first n natural numbers) $= \frac{n}{2}(n+1)$}

$\therefore$ $n^3 = 3S - \frac{3n(n+1)}{2} + n$

$3S = n^3 + \frac{3n(n+1)}{2} - n$

$= \frac{2n^3 + 3n^2 + 3n - 2n}{2}$

$= \frac{2n^3 + 3n^2 + n}{2}$

$= \frac{n(2n^2 + 3n + 1)}{2}$

$= \frac{n(n+1)(2n+1)}{2}$

$\therefore$ $S = \frac{n(n+1)(2n+1)}{6}$.

13. THANKFUL.—A boat's crew consisting of 8 rowers and a steersman is to be formed out of 12 persons, 9 of whom can row but cannot steer, while the other 3 can steer but cannot row; find in how many ways the crew can be formed.

Find also in how many ways the crew could be formed if one of the three were able both to row and to steer.

No. of ways in first case $= \frac{9.8}{1.2} \times 3$

$= 108$. Ans.

No. of ways in second case $= 108 + \left(\frac{9.8.7}{1.2.3} \times 2\right)$

$= 108 + 168$

$= 276$. Ans.

Mensuration.

1. VENTRILOQUIST.—The chord of the whole arc is 40, and the versed sine or height of the segment is 15; required the length of the arc.

Chord of half the arc $= \sqrt{20^2 + 15^2}$

$= \sqrt{400 + 225}$

$= \sqrt{625}$

$= 25$;

$\therefore$ Length of the arc $= \frac{(25 \times 8) - 40}{3}$

$= \frac{200 - 40}{3}$

$= 53\frac{1}{3}$

$= 53\frac{1}{3}$. Ans.

General.

1. ONE TRYING.—Your solution is quite correct.

2. C. BAGGLEY.—Thanks for your solution; it is quite correct. The question is not expressed very clearly.

3. ZEPHYR.—The solution of your query appeared in our issue for May, 1882.

4. SOLICITOR.—We cannot reply to anonymous queries. See Rule II. at head of Query Column.

5. NORTHANTS.—The solution of your query appeared in our issue for August, 1882.

6. AMBROSE.—You will find the solution of your query in our issue for April, 1884.

7. NOM DE PLUME.—(1) You will find the solution of your query in our issue for October, 1884. (2) Writing, perhaps 70 per cent. Looped letters in text-hand are very badly formed.

8. A JUNIOR.—If $\cos 41^\circ\ 24'\ 34{\cdot}6'' = \frac{3}{4}$, find an angle θ which satisfies the equation $4\cos 2\theta + 3 = 0$. (*Examination*, 1885)

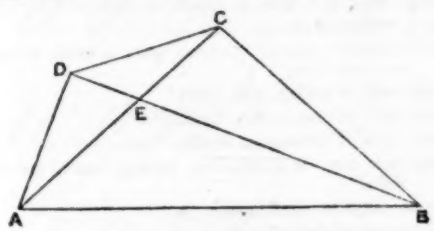
$$4\cos 2\theta + 3 = 0$$
$$4\cos 2\theta = -3$$
$$\cos 2\theta = -\tfrac{3}{4} \quad \{\cos A = -(\cos 180^\circ - A)\}$$
$$= \cos(180^\circ - 41^\circ\ 24'\ 34{\cdot}6'')$$
$$= \cos 138^\circ\ 35'\ 25{\cdot}4''$$
$$\therefore\ \theta = 69^\circ\ 17'\ 42{\cdot}7''.\ \text{Ans.}$$

9. A. SPHEROID.—A ship sailing out of harbour is watched by an observer from shore; and at the instant she disappears below the horizon, he ascends to a height of 20 feet, and thus retains her in sight 40 minutes longer. Find the rate at which the ship is sailing, assuming the earth to be a sphere of 4000 miles radius, and neglecting the height of the observer. (*Todhunter's* 'Trigonometry for Beginners.')

(Distance sailed by ship in 40 minutes)^2
$= 20\text{ ft.} \times 2 \times 4000\text{ miles.}$ (Page 93.)
$= (40 \times 4000 \times 5280)$ sq. ft.
$= (40 \times 40 \times 100 \times 16 \times 330)$ sq. ft.
$= (40^2 \times 40^2 \times 330)$ sq. ft.;

Distance sailed by ship in 40 minutes $= 1600\sqrt{330}$ ft.
$\therefore$ Rate of ship $= 40\sqrt{330}$ ft. per minute. Ans.

10. ARTHUR.—ABCD is a quadrilateral whose diagonals AC and BD intersect in E; the angle AEB is 105° 20′; and AC and BD are severally 343·64 feet and 673·75 feet long. Find to the nearest integer the number of square feet in the area of the quadrilateral.



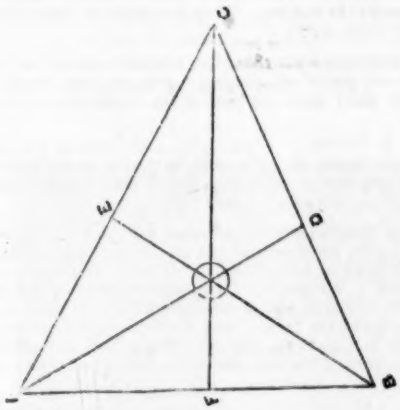
Area of $\triangle$ AEB $= \frac{1}{2}$ AE.BE . sin AEB;
" " CED $= \frac{1}{2}$ CE.DE . sin CED
$= \frac{1}{2}$ CE.DE . sin AEB; (I. 15.)
" " AED $= \frac{1}{2}$ AE.DE . sin AED
$= \frac{1}{2}$ AE.DE . sin AEB;
(sin of angle = sin of supplement)
" " BEC $= \frac{1}{2}$ BE.CE . sin BEC;
$= \frac{1}{2}$ BE.CE . sin AEB;

$\therefore$ Area of quadrilateral
$= \frac{1}{2}$ (AE.BE + CE.DE + AE.DE + BE.CE) sin AEB
$= \frac{1}{2}$ {AE(BE + DE) + CE(BE + DE)} sin AEB
$= \frac{1}{2}$ {(AE + CE) (BE + DE)} sin AEB
$= \frac{1}{2}$ (AC.BD) sin AEB
$= \frac{1}{2}$ (343·64 ft. × 673·75 ft.) . sin 105° 20′
$= (171{\cdot}82 \times 673{\cdot}75)$ sq. ft. × sin $(180^\circ - 105^\circ\ 20')$
$= 115{,}763{\cdot}725$ sq. ft. × sin 74° 40′
$= 115{,}763{\cdot}725$ sq. ft. × ·962849

·962849
1041873525
463054900
926109800
231527450
694582350
1041873525
111,462·986852525
$= 111{,}463$ sq. ft. Ans.

11. ——.—ABC is a triangle. AD, BE, CF, bisect the angles A, B, C, meeting the opposite sides in D, E, F, respectively.
If a, b, c, be the lengths of the sides opposite A, B, C, prove

$$\text{AE, BF, CD} = \frac{a^2b^2c^2}{(a+b)(b+c)(c+a)}$$



Let ABC be a triangle, and let the angles A and B be bisected by AD, BE, meeting the opposite sides in D and E, and let them intersect in O. Join CO and produce it to meet AB in F.

We must first prove that CO bisects the angle C, that is, shew that the three straight lines that bisect the three angles of a triangle pass through a point.

This is easily done by drawing perpendiculars to the sides of triangle from the point where two of the straight lines that bisect two of the angles meet, and showing by Euclid I. 26, that these three perpendiculars are all equal, and then by I. 47 and I. 8 that the third angle is bisected by the line joining it with the point of intersection of the other two straight lines.

We prefer here, however, to prove it as follows, as more in keeping with the problem which depends on it.

Since BO bisects the angle CBF of the triangle CBF,
Therefore, CO is to OF as CB is to BF.
But since AO bisects the angle FAC of triangle FAC,
Therefore CO is to OF as CA is to AF,
Therefore CB is to BF as CA is to AF, and alternately CB is to CA as BF is to FA (V. 16.)
Therefore CF bisects the angle ACB (VI. 3.)
Since BE bisects the angle B,
AE is to EC as c is to a.
Therefore AE is to AE + EC or b as c is to $c + a$ (V. 18.)
Similarly we can show
BF is to c as a is to $a + b$, and CD is to a as b is to $b + c$.
And compounding these proportions, AE, BF, CD is to b, c, a, as $a\ b\ c$ is to $(c+a)\ (a+b)\ (b+c)$.

Therefore, AE, BF, CD $= \dfrac{a^2b^2c^2}{(c+a)(a+b)(b+c)}$. Q. E. D.

Note.—Todhunter calls this last step rather semi- than purely geometrical.

12. CRETONUM.—We are glad to consider your case and offer you good advice. One would naturally expect you to take a high place on the list, from the marks you quote. Unfortunately, your letter is so badly composed, that we cannot encourage you to hope for even a place on the list unless you make

the study of English your chief business. We wont pain you by printing any of your letter; it is, however, nearly as bad as it can be. Read some good English authors. Could you get *Morley's* 'Life of Cobden' from a library, or *Cowper's* 'Letters,' or *Southey's* 'Life of Nelson.' *Dr. Abbott's* 'English Lessons for English People' (Seeley) would be of great service to you.

13. ANXIETY.—There is no option; you must take the second year papers. We know of no such class as you refer to. Your list of books is very good indeed so far as it goes; you have no English authors among your books. *Dr. Abbott's* 'Shakespearian Grammar' is almost indispensable, and *Morris's* 'Lessons in Historical English,' 2s. 6d., should be studied. What about Music, Economy, and Geography?

14. ZINGO.—The scholarship examination does not comprise the subject of drawing. You may learn very much from the lessons which you have named. They are excellent. Yes, you can sit in July, 1887, or before if you like. Large hand 70, small hand 75.

15. EXCELSIOR.—You should have a second book. We should prefer the lectures. They cost about 6s.; the other book is sold at about 4s. 6d.

16. LABIENUS.—You should go to some teacher and inquire if he can tell you of an opening; you can then begin work. You may enter upon any year, if the committee and inspector consent.

17. T. S. VINCENT.—There is no such book as you ask for, that we are aware of. We shall be glad to name trustworthy works on any part of the course. You will hardly expect to find one book containing all you want.

18. NIL DESPERANDUM.—Under the special circumstances that you name, could you not get all the advice you want from one likely to know better than we can do? You could not get a certificate at all until you become connected with a school. We see no difficulty in your obtaining what you want in time. Order a copy of the 'Code' and read the regulations for yourself. You have plenty of examples of questions and answers in the PRACTICAL TEACHER, and we will help you in any way we can.

19. CADER IDRIS.—The questions set at the Cambridge Middle-class Examinations are published by the University Press, and can be ordered through any bookseller.

20. WM. W.—Your teacher or your secretary could write to the Council Office, and ask whether you would be placed on the list in case you should pass. Then you would not be in doubt. It is highly probable that the reason your name is not on the list is simply because you did not get enough marks. How did you find out that you were suspended? For how long was it? Your account seems to us improbable.

21. H. W. A.—As the examination is held at all the colleges at precisely the same time, you will see that you cannot try at first one and then another. You are not able to go to any Training College unless you satisfy the managers of it that you are, in their opinion, a fit and proper person to become a teacher in an elementary school. There is nothing to prepare for the scholarship examination beyond what you say. Could you not take your teacher's opinion, or your secretary's, as to where you would like to go, and when you have decided, write to the secretary of the college for particulars. He is sure to tell you.

22. A. POLLARD.—Yes, most likely. You see they are answered in the present number. If you turn to the October number you will find a detailed plan for the next year.

23. SUBSCRIBER.—'Euclid': *Mackay's* (Chambers); *Todhunter's* (Macmillan); *Casey's*; *Mansford's* (Hughes). 'Algebra': *Hall's* (Macmillan). 'Mensuration': *Todhunter's* (Macmillan). 'School Management': *Collins'* or *Gladman's* or the 'Manuals of the National Society.' For 'Music,' see answers in last month's queries.

24. Try *Macmillan's* 'Progressive Course.' Part I., 1s.; part II., 1s. 6d. The 3s. 8d. edition will suit your purpose. There are some chapters in *Seeley* and *Abbott's* 'English for English People,' which will be most useful to you. Get the book and study it.

25. PEDAGOGUE.—Yes, if you have a good teacher. You are not at all likely to make sure and rapid progress by yourself. If you can get no help, then take courage and do your best. Large hand, 70; small, 80.

26. AVIDUS.—Elementary Physiology, *Foster's* 'Primer,' and *Huxley's* 'Elementary Geology.' For Advanced Physiology, *Foster's* 'Text-Book' (Macmillan), 24s. For Advanced Geology, *Jukes-Browne's* 'Text-Book of Geology.' Writing, 60.

27. ULRICA.—Yes, you can go on if it is thought desirable. Your writing would not justify it. What does your teacher say?

28. ASPIRANT.—We have not seen that statement. Do not be misled by it. The B.A. of London is not easily gained, you may be sure. At the same time, it is within the reach of a few of the best students if they are diligent and self-denying enough to work for it. Write for a copy of the syllabus for the Matriculation, and when you have passed that, it will be time enough to think about the regulations for the B.A. degree. Don't trouble about science subjects, if you are thinking of a degree in arts, beyond chemistry and, perhaps, mechanics. Use *Roscoe's* 'Chemistry,' and *Twisden's* 'Theoretical Mechanics.' Writing, 60.

29. JOHN EVANS.—Yes; quite sufficient. For arithmetic and mensuration, *Capel's* 'Catch Questions.' For algebra, Miscellaneous Examples in *Hall's* 'Algebra,' or *H. Smith's*. For Euclid, the exercises in the best school editions. See query No. (23).

30. BLANCHE.—Small hand 85; large hand 80.

31. SCRIBO CALAMO.—The writing is good. It is worth 85.

32. TIMOTHY.—We cannot tell you what you ask, but you can get the information by writing for it to the Secretary of the War Department, Whitehall, S.W.

33. ADOLPHUS.—Composition 80; writing 75.

34. TIMOTHY.—Composition 90; writing 65.

35. DELTA.—*Maybury's* 'Ovid's Metamorphoses,' Book I., with translation and notes, 2s. (Bailliere, Tindall, and Cox). Livy, xxi. and xxii. *W. H. Capes*, 5s.

36. GRÆCA.—Hercules Furens, 2s; *Hutchinson* (Pitt Press).

37. XMAS.—

Now—interjection.
but—preposition, showing relation between 'choose' and 'hear.'
hear—infinitive, gov. by *but*.
there—expletive adverb.
only—adverb of limitation, modifying 'did speak.'
than—sub. conjunction of comparison, joining 'we could not speak,' and 'we could speak.'
if—sub. conjunction of condition, joining 'we could speak,' and the following sentence.
speck—the case is nom., in apposition with 'it.'
thrice—numeral adverb.
all—indefinite numeral pronoun, case is nom., in apposition with 'they.'
dead—adj. of quality, qual. 'they.'
ever—adv. of time, modify. 'had,' etc.
sure—adv. of affirmation, modify. 'took.'
like—sub. conj. of comparison, joining 'sank,' and 'leak sinks.'
never—negative adv., modify. 'a.'
alone—adj. of distinction, qual. *me*.

Writing—large hand 55, small 60.

—o—

Mulhauser's System of Teaching Writing.

BY J. H. COWHAM, F.G.S.,
Westminster Training College.

IN the year 1829 M. Mulhaüser was appointed Inspector of Writing by the Primary Schools Commission of Geneva. He found writing taught without any

approach to method in the schools under his supervision. Copies were distributed for imitation, either in haphazard fashion, or in the alphabetic order of their initial letter. Children with remarkable imitative powers made satisfactory progress; but the majority made but slow advance. The art of writing correctly was acquired only after laborious and long continued effort.

Mulhaüser at once determined to place the teaching of writing in the schools under his control upon a rational basis. After careful analysis of all the small script characters, he reduced them to the following four elementary forms:—

1. Elements:

i. The right line down and up

ii. The curve down and up

iii. The loop down and up

iv. The crotchet

2. Classification:

The twenty-six small letters were next arranged in seven groups, each with one or more of the above fundamental forms as the distinctive feature in the grouping

		Characteristics.
1st Class.	*t a t l*	The right line with the addition of a curve at the bottom, called a **link.**
2nd Class.	*n m p h*	Introduces the **hook**, a curve in the opposite direction to the link. NOTE: *Both link and hook are chiefly used to join right line.*
3rd Class.	*c o e*	The new feature in Class 3 is the curve.
4th Class.	*a d g*	Union of curve and right line.
5th Class.	*w v r b*	Introduces the crotchet.
6th Class.	*j g y f*	Class of loop letters.
7th Class.	*k s x z*	Complex letters.

3. Rules for Writing:

By means of this classification the following conditions for exercising the art of writing were readily established in place of the haphazard arrangement of copies previously in use.

1. From the Simple to the Complex: The simple forms—right lines—were first practised. New elements, such as the curve, the crotchet, and the loop, were gradually introduced, until the most complex letter forms were reached.

2. Repetition without Mechanical Dullness: The practice of writing the simple forms in new combinations, and their recognition in these new shapes supplied:—

(*a*) The repetition necessary for acquiring skill in the art of writing.

(*b*) Sufficient variety of exercise to stimulate effort.

3. Regularity of Outline: By means of which beauty and legibility are obtained.

Mulhaüser devised expedients (Rhomboids) by which the exact shape of each letter could be determined, and the slightest error discovered and corrected.

MULHAÜSER'S RHOMBOIDS.

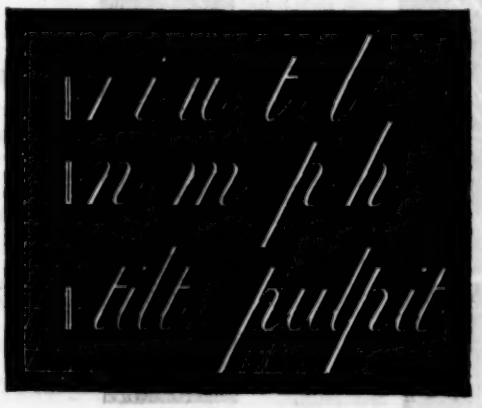


Fig. 1.

In these rhomboids the horizontal lines determine the height of each letter, the oblique lines the slope of each letter, and the middle horizontal lines fix the position of most of the joinings.

For class teaching it is necessary to provide a blackboard, ruled with lines like those in the diagram. Slates for the younger children, and copy-books for the more advanced, may be similarly ruled for individual practice.

4. Names of Elements, and their Combination into Letters:

When Mulhaüser had reduced the script characters to their elementary forms, and had classified them in groups in the order of difficulty, and had further devised his rhomboids so as to secure uniformity and legibility, he proceeded to name each portion of the letter forms.

When these names have been thoroughly learnt, it is possible to build up complete letters and words from the dictation of their several parts.

The following is the complete script alphabet, arranged in the order in which the letters are taught. The names of the elements are printed opposite the letters in which they are found.

Letters.*	Description of Elements.	Letters.	Description of Elements.
i	right line; link.	j	right line, 2 heights down; loop; ½-link.
w	right line, link; right line, link.	g	double curve; as for 'j.'
t	right line 1½ heights; link, bar.	y	hook, right line, link; as for 'j.'
l	right line, 2 heights; link.	b	right line, 2 heights; link; crotchet.
n	hook, right line; hook, right line; link.	f	loop, 1 height above; right line, 3 heights; crotchet.
m	hook, right line; hook, right line; link.	r	hook, right line; crotchet.
h	right line, 2 heights; hook, right line, link.	v	hook, right line; link, crotchet.
p	right line, 2½ heights, one height down; hook, right line, link.	w	right line, link; right line, link; crotchet.
c	curve, link.	k	right line, 2 heights; hook, ½-curve; ½-curve, link.
o	double curve, half crotchet.	s	link, to the height; 2 half-curves.
e	loop, curve, link.	x	hook, 2 opposite curves; link.
a	double curve; right line, link.	z	crotchet, right line, hook; curve, 1 height down; loop, ½-link.
d	double curve; right line, 2 heights; link.		
q	double curve; right line, 2 heights down; half crotchet.		

Fig. 2.

Note.—When the above letters are united into words, considerable difficulty is found when a hook follows a link. It should be remembered that in this case, instead of occupying two spaces, the two together occupy a space and a half.

Similarly when *c* or *e* is followed by a hook, a half space is lost.

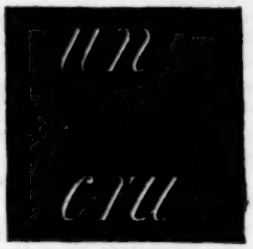


Fig. 3.

It will be found upon examination of the list given above that the elements are frequently repeated. The difficulty of learning them is not great. A case is stated of a boy eight years old, in the primary schools at Versailles, who dictated the elements of the word *invariablement* after eleven days' instruction.

Mulhaüser's system in its entirety has not been universally adopted in this country, though some of his expedients are found in most copy-book series. Pupil teachers and students in training colleges use the system in their handwriting exercises. Should the Code syllabus ever require the standards to exhibit writing exercises arranged in a rational series, some such system as Mulhaüser's would be in immediate request. Pastor Naville, in his work on *Education Publique*, describes the system as 'remarkable for the simplicity of its principles, and for the skill shown in the graduation of its exercises, in the union of theory with practice, and in bringing the intelligence of the pupils into action.'

* The order and shape of the letters are those sanctioned by the Committee of Council on Education in a pamphlet published by authority in 1849. The letter 'j' is correct in shape, but should in any word combination be placed on the right side of the oblique guiding line.

—o—

Pupil Teachers' Examination Papers.

FIRST YEAR.

Pupil Teachers at end of First Year.

Three hours and a half allowed.

Arithmetic.

MALES.

1. Simplify:—

$$\frac{2\frac{3}{4}\text{ of }1\frac{1}{7}+5\frac{1}{4}\text{ of }3\frac{1}{3}\div 4\frac{1}{2}}{7\frac{1}{2}-2\frac{1}{2}}.$$

$$\frac{2\frac{3}{4}\text{ of }1\frac{1}{7}+5\frac{1}{4}\text{ of }3\frac{1}{3}\div 4\frac{1}{2}}{7\frac{1}{2}-2\frac{1}{2}}$$

$$=\frac{\frac{11}{4}\times\frac{13}{7}+\frac{16}{3}\times\frac{13}{3}}{4\frac{1}{2}}\div\frac{57}{8}\times\frac{8}{114}$$

$$=\frac{\frac{143}{7}+\frac{176}{9}}{\frac{45}{9}}\div\frac{114}{57}$$

$$=\frac{297+1232}{63}\times\frac{57}{114}$$

$$=\frac{1529}{63}\times\frac{8}{114}\times\frac{57}{114}$$

$$=\frac{1529}{126}$$

$$=3\frac{151}{126}.\text{ Ans.}$$

2. Multiply ·375 by ·0735, and prove the correctness of the pointing by vulgar fractions.

$$\begin{array}{r}\cdot375\\ \cdot0735\\ \hline 1875\\ 1125\\ 2625\\ \hline \cdot0275625.\end{array}\qquad \text{Ans.}$$

$$\frac{375}{1000}\times\frac{7325}{100000}=\frac{275625}{10,000,000}=\cdot0275625$$

3. Express $49\frac{1}{2}$ yards in metres correct to four decimal places (taking 1 metre = 39·371 in.)

$$49\tfrac{1}{2} \text{ yds.} = (\tfrac{99}{2} \times \tfrac{36}{1}) \text{ in.} = \tfrac{3564}{2} \text{ in.} = 1778{\cdot}4 \text{ in.}$$

in. in. met. metres.
39·371 : 1778·4 :: 1 : 45·1703+. Ans.

4. If a bankrupt's assets amounted to £769 16s., and his creditors lost £1283; what did he pay in the £?

Total debts = Loss + assets = £1283 + £769 16s.
= £2052 16s.

£ s. £ £ s. s. d.
2052 16 : 1 :: 769 16 : 7 6. Ans.

FEMALES.

1. Find by practice the cost of 59 lb. 11 oz. 17 dwt. 12 gr. at £4 5s. 4d. per lb. If the whole be sold at 5 grains for a penny, how much will the profit be?

		£	s.	d.	
6 oz. = ½ lb.		4	5	4	Cost of 1 lb.
				59	
		251	14	8	,, 59 lb.
3 oz. = ½ of 6 oz.		2	2	8	,, 6 oz.
2 oz. = ⅓ of 6 oz.		1	1	4	,, 3 oz.
10 dwt. = ⅓ of 2 oz.		0	14	$2\frac{2}{3}$	,, 2 oz.
5 ,, = ½ of 10 dwt.		0	3	$6\frac{2}{3}$	,, 10 dwt.
2 ,, = ⅖ ,,		0	1	$9\frac{1}{3}$	,, 5 ,,
12 gr. = ⅙ of 2 dwt.		0	0	$8\frac{1}{15}$	,, 2 ,,
		0	0	$2\frac{7}{15}$	,, 12 gr.
		£255	19	$1\frac{1}{2}$	,, 59 lb. 11 oz. 17 dwt. 12 gr.

lb. oz. dwt. gr.
59 11 17 12
12
719 oz.
20
14397 dwt.
24
57600
28794
5) 345540 gr.
12) 69108 d.
20) 5759
£287 19s.

£287 19s. − £255 19s. $1\frac{1}{2}$d. = £31 19s. $10\frac{1}{2}$d. profit.

2. How much shall I have left out of £100 after paying for—

48 pairs of blankets at 12s. 6½d. per pair.
3000 yards of calico at 4s. 5d. per dozen yards.
936 reels of cotton at 15s. per gross.
15 yards of velvet at 9s. 11d. per yard.

	£	s.	d.
	100	0	0
48 pairs of blankets at 12s. 6½d. per pair =	30	3	0
3000 yds. calico at 4s. 5d. per doz. yds. =	55	4	2
936 reels of cotton at 15s. per gross =	4	17	6
15 yds. velvet at 9s. 11d. per yd. =	7	8	9
	£97	13	5
	£2	6	7 Ans.

3. (*a*) What do you understand by *Prime Numbers* and *Composite Numbers*? Illustrate your answer by reference to the numbers 7, 24, and 36.

(*b*) A number of marbles can be divided exactly into groups of 14, but when placed in groups of 8, 15, or 24, there is always a remainder of 6. What is the least number which admits of this arrangement?

(*a*) Prime numbers are such as have no factors but themselves and unity. 7 is a prime number; it cannot be divided by any whole No. but itself and 1 without a remainder.

Composite numbers are the product of two or more numbers; thus 24 is the product of 6 and 4, or 3 and 8, or 2 and 12, or 2, 3, 2 and 2. 36 is the product of 4 and 9, or 2, 2, 3 and 3.

(*b*) No. = 6 + L.C.M. of 8, 15, 24.
= 6 + 120 = 126. Ans.

4. Add together $2\frac{1}{7}$, $\frac{7}{15}$, $1\frac{11}{21}$, and $\frac{13}{35}$, and from the result take away $\frac{13}{105}$.

$$(2\tfrac{1}{7} + \tfrac{7}{15} + 1\tfrac{11}{21} + \tfrac{13}{35}) - \tfrac{13}{105}$$
$$= \left(3\,\frac{60+49+100+48}{105}\right) - \tfrac{13}{105}$$
$$= 3\tfrac{157}{105} - \tfrac{13}{105}$$
$$= 3\tfrac{144}{105}$$
$$= 5\tfrac{1}{5}. \text{ Ans.}$$

Grammar.

MALES AND FEMALES.

1. 'But now
To the wide *world's* astonishment, *appeared*
A glorious *opening*, the *unlooked-for* dawn
That *promised* everlasting *joy* to France.'

Analyse these lines, and parse the words printed in italics:—

ANALYSIS.

Sentence.	Kind of Sentence.	Con.	Subj.	Pred.	Object.	Exten.
(*a*) But now to the wide world's astonishment appeared a glorious opening, the unlooked-for dawn	Princ. Sent. *co-ord. advers.*	But	A glorious opening, the unlooked-for dawn	appear'd		Now (time) to the wide world's astonishment
(*b*) that promised everlasting joy to France	Adj. sent. to *a*	*In rel.*	that	promised	everlasting joy to France	

But—disj. conj., joining 'A glorious opening,' etc., to a preceding sentence.
now—adv. of time, qualifying *appeared*.
world's—com. noun, neut., sing., poss., gov. by *astonishment*.
appeared—reg. intrans. verb, act., ind., past, 3rd pers., sing., agr. with *opening*.
opening—com. noun, neut., sing., 3rd pers., nom. to *appeared*.
unlooked-for—adj. of quality, qual. 'dawn.'
promised—reg. trans. verb, act., ind., past, sing., 3rd pers., agreeing with *that*.
joy—abs. noun, neut., sing., obj., governed by *promised*.

2. State any English terminations of adjectives which mean 'belonging to,' 'likeness,' 'direction,' and 'negation,' and give instances of words in which they occur.

Belonging to: *y*—mighty, heady, stormy.
Likeness: *ly*—kingly, manly, gentlemanly.
like—ladylike, warlike.
Direction: *ern*—northern, eastern.
erly—southerly, westerly.
ward—northward, southward.
Negation: *less*—houseless, homeless.

3. What is meant by regular, irregular, auxiliary, defective, transitive, and intransitive verbs? Give examples.

Regular verbs are those which form their past tense and past participle by adding *d* or *ed* to the present, as: love, loved, loved; roar, roared, roared.

Irregular verbs do not form their past tense and past participle by adding *d* or *ed*, but in an irregular way, as: sing, sang, sung; ride, rode, ridden.

Auxiliary verbs are those which are used in assisting to form the voice, mood, form, or tense of other verbs, as: am, have, can, in—am loved, have eaten, do love, can go.

Defective verbs are such as want one or more of their principal parts, as: can, could. 'Can' has no past participle.

Transitive verbs are those which express action passing from an agent to an object, as: *love* in—*I love the boy*.

Intransitive verbs express being, state of being, or action not passing over to an object, as: *am* and *sleep* in—I am: Dogs sleep.

Geography.

(Answer two Questions, and draw one Map.)

1. Draw a map of one of the following :—
   (*a*) The coast line of Ireland from Dublin to Limerick.
   (*b*) Western Australia.
   (*c*) The basin of the St. Lawrence.

2. What towns or districts in the United Kingdom are noted for the following industries :—the manufacture of lace, carpets, locomotives, glass, leather, earthenware, and linen; the smelting of iron, the quarrying of slate, and lead and copper mining?

Lace—Nottingham; Honiton, in Devon.
carpets—Kidderminster, Halifax, Rochdale.
locomotives—Newcastle and Gateshead, Darlington, Crewe, Swindon, Leeds, Manchester.
glass—Newcastle-on-Tyne, Sunderland, London, St. Helen's, Gateshead.
leather—Bermondsey (London), Northampton, Stafford, Leicester, Leeds.
earthenware—The Potteries in N. Staffordshire (Hanley, Burslem, Longton, Stoke), Derby, Worcester.
linen—Barnsley.
smelting of iron—Middlesborough and Cleveland, Rotherham, Merthyr Tydvil, Consett, and South and West Durham.
slate—Cumberland, North Wales (Festiniog).
lead mining—West Durham, Cumberland, Derbyshire, Cornwall, and Devon.
copper mining—Cornwall and Devon.

3. Name the chief physical features, industries, and exports of Manitoba, British Columbia, and South Australia

Manitoba.—Entirely flat, watered by the Red R., Souris R., and Assiniborie R., which flow into L. Winnipeg, the southern portion of which touches the N. boundary of the province. People engaged in clearing forests, agriculture, and cattle rearing. Exports flour, timber, and meat.

British Columbia.—Mountainous in the E., gradually levelling as we approach the Pacific Ocean, Mt. Hooker and Mt. Brown reaching 16,000 ft. Soil well suited for agriculture. Coal and gold found in abundance. The produce of the mines, fields, lakes, and rivers form the chief exports.

South Australia has the Flinders Range along its S.E. boundary, the Ashburton Range in the N., the Macdonnel Range in the centre. The northern district is watered by the Roper, Liverpool, Adelaide, and other rivers; and the south by the Murray, Wakefield, Gawler, and Torrens. Lakes—Torrens, Eyre, and Amadeus, are found in the S. The people are engaged in sheep farming, cattle rearing, wheat growing, and in mining. The exports are copper, wheat, wool, fruit, hides, tallow, silver, lead, bismuth, and tin.

4. How do mountains contribute to the earth's fertility?

Mountains serve as condensers of the vapour in the atmosphere, which would pass over them without their presence. Districts are thus provided with rain which would otherwise be rainless. Their tops are covered with snow, which melts during the summer and forms a continual supply of water for the plains and valleys. They are also the sources of springs. The rain which falls on the mountains carries with it soil, which is washed down into the valleys, and these alluvial deposits are among the most fruitful parts of the earth's surface. They often shelter districts from cold or hot winds, which would otherwise affect the fertility of many districts.

History.

1. At what period did the Romans invade Britain? What induced them to do so?

The Romans first came to Britain in the year 55 B.C., and again in 54 B.C. They did not, however, permanently occupy the country till 43 A.D. The British Isles had been known as the Tin Islands for many centuries, and the Romans among other nations had received some of their mineral treasures. Julius Cæsar, the military commander of the Roman Empire in France, hoped to add the glory of the conquest of Britain to that which he had already obtained, and to increase the wealth of his country by obtaining possession of the valuable pearl fisheries and the deposits of mineral wealth which it was reputed to possess. These were the chief reasons for the invasion of Britain.

2. When the Romans abandoned Britain, in what state did they leave it?

The people of England under the Romans had become more civilized. They had learned to build better houses, better towns, to make roads, and, in short, had become acquainted with the arts, customs, and habits of civilized nations. They were less warlike, and more accustomed to trade, and many of the products of the country found a ready market in different parts of the Roman Empire. The youth of the country were drafted largely into the Roman legions serving abroad, and the country was thus less able to cope with foreign invaders than it would otherwise have been. The people had ceased to be pagans in great measure, the Christian religion having been introduced during the first century.

3. How many of our Saxon kings were named Edward? Distinguish them with their dates, and sketch the character of the last of them.

There were three Saxon Edwards, namely :—

Edward I. (the Elder)	...	...	901— 925
Edward II. (the Martyr)	...	...	975— 979
Edward III. (the Confessor)	...	...	1041—1066

Edward having been brought up for many years in France, had imbibed French ideas, adopted French manners, and spoke the French language. He thus favoured the friends of his youth, and alienated the affections of his Saxon subjects. He did good service, however, to his country, by compiling a code of laws and abolishing Danegelt. He was hardly fitted to be a ruler in boisterous times, loving the cloister rather than the army—and the general estimate placed upon his character may be found in the name of Confessor given to him for his zeal and the church works which he accomplished.

Composition.

Write from memory the substance of the passage read to you by the Inspector.

The following was the passage :—

The day before leaving Sierra Leone we witnessed one of those flights of locusts which sometimes visit the settlement with such destructive effect. It first appeared about 3 p.m., and did not end till sunset. The insects followed one another in such myriads, that they made a long and broad line in the air as they passed through it. The inhabitants lighted fires, and mustered with drums, tom-toms, and such other things as would assist by their noise in preventing the devastating legions from making a descent on the plantations, where they would quickly have reduced every edible herb to a leafless state. As the people here do not, as the Arabs, use the locusts for food, their visits are regarded as a perfect scourge.

Needlework.

FEMALES.

One hour was allowed for this exercise *in the afternoon.*

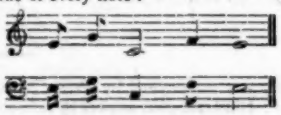
Music.

OLD NOTATION.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

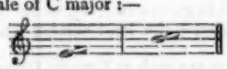
1. Re-write the following an octave lower on the Bass clef, halving the value of every note :—

1.



2. Write down the minor 2nds contained between the notes of the diatonic scale of C major :—

2.



3. Add bars to the following passage, in accordance with the time-signature :—

3.

TONIC SOL-FA NOTATION.

1. Between which tones of the scale is there an interval of a major 2nd :—

1. Between d-r; r-m; f-s; s-l; l-t.

2. Write the pulse-signs (1) for three-pulse measure, and (2) for four-pulse measure :—

2. (1) | : : ‖ (2) | : | : ‖

3. Write (using two-pulse measure) one note continued through four pulses, and two notes each through two pulses :—

3. |d :— |— :— |d :— |d :— ‖

—o—

SECOND YEAR.

Pupil Teachers at end of Second Year.

FIRST PAPER.

Three hours and a half allowed.

Euclid.

MALES.

[All generally understood abbreviations for words may be used, but not symbols of operation, such as −, +, ×.]

(*Answer two questions, including No. 3, if you can.*)

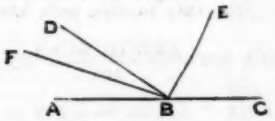
1. To bisect a given rectilineal angle, that is, to divide it into two equal angles.

Euclid : Book I., Prop. 9.

2. If two triangles have two angles of the one equal to two angles of the other, each to each, and one side equal to one side, viz, either the sides adjacent to the equal angles in each, or the sides opposite to them; then shall the other sides be equal, each to each, and also the third angle of the one equal to the third angle of the other.

Euclid : Book I., Prop. 26.

3. DB meets the straight line ABC in B; BE, BF bisect the angles DBC, ABD. Show that FBE is a right angle.



Because the straight line DB makes with the straight line ABC the two ∠s DBA, DBC, these ∠s are together equal to two right angles. (I. 13.)

But the ∠ FBD is half the ∠ ABD, and the ∠ DBE is half the ∠ DBC. (Hyp.)

∴ the ∠s FBD, DBE are together half the ∠s ABD, DBC together.

But ∠s ABD, DBC are together equal to two right angles.

∴ the ∠s FBD, DBE (*i.e.*, the ∠ FBE) together make a right angle.

Q.E.D.

Arithmetic.

FEMALES.

1. Simplify :— $1\frac{1}{2}+\frac{3\frac{1}{2}-\frac{1}{2}}{3\frac{1}{2}+\frac{1}{2}}-2\frac{1}{2}$ of $\frac{1}{13}-\frac{2}{7}$.

$$1\tfrac{1}{2}+\frac{3\tfrac{1}{2}-\tfrac{1}{2}}{3\tfrac{1}{2}+\tfrac{1}{2}}-2\tfrac{1}{2}\text{ of }\tfrac{1}{13}-\tfrac{2}{7}$$
$$=1\tfrac{1}{2}+(3\tfrac{1}{4}\div 3\tfrac{1}{2})-(\tfrac{1}{8}\times\tfrac{1}{13})-\tfrac{2}{7}$$
$$=1\tfrac{1}{2}+(\tfrac{13}{4}\times\tfrac{2}{13})-\tfrac{1}{8}-\tfrac{2}{7}$$
$$=\tfrac{1}{2}+\tfrac{1}{8}\tfrac{2}{8}-\tfrac{1}{8}-\tfrac{2}{7}$$
$$=\frac{315+182-42-180}{210}$$
$$=1\tfrac{1}{2}\tfrac{7}{0}.\text{ Ans.}$$

2. What fractional part of three half-crowns is $\frac{3}{5}$ of $\frac{1}{3}$ of £2 5s. $+3\frac{4}{17}$ of 2s. $1\frac{1}{2}$d. $-\frac{2}{3}$ of 4s. 8d. ?

$$\frac{\frac{3}{5}\text{ of }\frac{1}{3}\text{ of }45\text{s.}+3\frac{4}{17}\text{ of }2\text{s. }1\frac{1}{2}\text{d.}-\frac{2}{3}\text{ of }4\text{s. }8\text{d.}}{2\text{s. }6\text{d.}\times 3}$$
$$=\frac{\frac{1}{5}\times\frac{1}{3}\times\frac{4}{1}\frac{5}{7}+\frac{1}{3}\frac{3}{4}\times\frac{1}{3}\frac{7}{2}-\frac{2}{3}\times\frac{1}{3}\frac{4}{2}}{\frac{1}{3}\frac{5}{2}}$$
$$=\frac{\frac{3}{5}+\frac{1}{8}\frac{7}{2}-\frac{2}{3}\frac{8}{4}}{\frac{1}{3}\frac{5}{2}}$$
$$=\frac{60+165-70}{24}\times\frac{2}{1}\frac{5}{3}$$
$$=\frac{1}{2}\frac{5}{4}\times\frac{2}{1}\frac{5}{3}$$
$$=\frac{2}{3}\frac{5}{2}.\text{ Ans.}$$

3. *Prove* the rule for the conversion of a decimal into a vulgar fraction, and show what decimal represents the value of

$$\frac{\frac{1}{10}}{(\frac{2}{3}\div 5)+(2\frac{2}{5}-\frac{1}{5})}$$

A figure in the units' place retains its real value, and every successive figure to the right is $\frac{1}{10}$th of the one on its left. It thus follows that in a decimal fraction the first figure to the right of the units is represented by so many tenths, the next by hundredths, and so on. The L.C.M. of these numbers will be equal to the highest of these denominators, and the numerator to the sum of the numerators, or to the dec. fraction. It thus follows that a dec. may be converted into a vulgar fraction by writing the dec. frac. as the numerator, and for the denominator 1 followed by as many 0's as there are figs. in the dec. fraction.

Example.—$\cdot 625=\frac{6}{10}+\frac{2}{100}+\frac{5}{1000}=\frac{600+20+5}{1000}=\frac{625}{1000}$.

$$\frac{\frac{1}{10}}{(\frac{2}{3}\div 5)+(2\frac{2}{5}-\frac{1}{5})}$$
$$=\frac{\frac{1}{10}}{\frac{2}{30}+1\frac{2}{5}}$$
$$=\frac{\frac{1}{10}}{\frac{2}{30}+1\frac{12}{30}}$$
$$=\frac{1}{10}\div 1\frac{14}{30}$$
$$=\frac{1}{10}\times\frac{30}{44}$$
$$=\frac{3}{44}$$
$$=\cdot 053.\text{ Ans.}$$

4. The contributions of A, B, and C averaged £13,200 each; A contributed $\frac{1}{2}$ of the whole; B's contribution amounted to $\frac{9}{11}$ of A's; what sum did C contribute?

A contributed $\frac{1}{2}$
B " $\frac{9}{11}$ of $\frac{1}{2}=\frac{9}{22}$
Total contributions of A and B $=\frac{1}{2}+\frac{9}{22}=\frac{20}{22}=\frac{10}{11}$
C's contribution $=1-\frac{10}{11}=\frac{1}{11}$
Total contributions $=13,200\times 3=39,600$
A's $=\frac{1}{2}$ of 39,600 $=$ 9,900
B's $=\frac{9}{11}$ of 9,900 $=$ 8,100
C's $=\frac{1}{11}$ of 39,600 $=$ 21,600. Ans.

Grammar.

MALES AND FEMALES.

1. 'They *do not* err
Who say *that when* the poet dies
Mute nature *moans* her worshipper
And celebrates his *obsequies*.
Who say tall cliff and cavern *lone*
For the *departed* Bard *make moan*.'

Paraphrase this passage, analyse the subordinate sentences, and parse the words printed in italics.

No mistake is made by those who affirm that inanimate objects mourn the loss of him who has sung their praises, Nature herself dying in sympathy, or who say that the mighty rocks and solitary caverns make moan for the dead poet.

ANALYSIS.

Sentence.	Kind of Sentence.	Connective.	Subject.	Predicate.	Object.	Exten. of Pred.
(*a*) Who say	Adj. to *they* in Princ. Sent.	*In rel.*	who	say		
(*b*) that mute nature moans her worshipper	Noun Snt. obj. to (*a*)	that	mute nature	moans	her worshipper (ind. obj.)	
(*c*) and celebrates his obsequies	Noun Snt. obj. to (*a*)	and	[she]	celebrates	his obsequies	
(*d*) when the poet dies	Adv. Sent. to (*a*)	when	the poet	dies		
(*e*) who say	Adj. to *they* in Princ. Sent.	*In rel.*	who	say		
(*f*) tall cliff and cavern lone for the departed Bard make moan	Noun Sen. obj. to (*e*)		tall cliff and cavern lone	make	moan (dir. obj.) for the departed Bard (ind. obj.)	

Not—adv. of negation, mod. *do err.*
who—rel. pro., agreeing with its antecedent *they*, com., plur., 3rd, nom, to *say.*
that—cop. conj., joining the sents. 'Who say,' and 'mute nature moans.'
when—cop. advl. conj., joining the sents. 'mute nature moans,' and 'the poet dies.'
mute—adj. of quality, qualg. *nature.*
moans—reg. intrans. verb, act., ind., pres., sing., 3rd, agreeing with *nature.*
obsequies—com. noun, neut., plur., gov. by *celebrates.*
lone—adj. of quality, qualg. *cavern.*
departed—partl. adj. of quality, qualg. *Bard.*
make—irreg. trans. verb, act., ind., pres., 3rd, plur., agreeing with *cliff* and *cavern.*
moan—com. noun, neut., sing., gov. by *make.*

2. What Latin prefixes occur in the above passage? Mention some words in which these prefixes undergo a modification.

Ob in *obsequies* becomes *oc* in *occur*, *of* in *offend*, *op* in *opportunity.*
de in *departed* becomes *dis* in *dissimilar*, *dif* in *differ*, *di* in *digest.*

3. State the various kinds of subordinate sentences. Why are they so called? and how are they distinguished?

Subordinate sentences are of three kinds: Noun, Adjective, and Adverbial.
They are so called because they do the work or are used in the place of the parts of speech after which they are named.
If the sentence is used as the subject, or object, or nominative completion of a predicate it is a noun sentence.
If the sentence qualifies a noun, it is an adjective sentence.
If it qualifies a verb, or adjective, or adverb, it is an adverbial sentence.
They are distinguished, therefore, by their different uses.

Geography.

(Answer *two* questions, and draw *one* map.)

1. Draw a map of one of the following:—
(*a*) Coast-line from Hamburg to Bordeaux.
(*b*) Basin of the Rhine or Ganges.
(*c*) The Balkan Peninsula.

2. What parts of Europe are particularly suitable for the growth of corn, olives, flax, the vine, tobacco, hops, oranges, and beet?

Corn.—Southern Russia, Hungary, Turkey.
Olives.—Italy, Spain, S. France, Turkey.
Flax.—Germany, Russia, Ireland, Belgium, Holland, Italy, Turkey.
The vine.—France, Spain and Portugal, Hungary, Italy, Turkey.
Tobacco.—Turkey and France, Holland and Belgium.
Hops.—S. E. England.
Oranges.—Spain and Portugal, S. France.
Beet.—France, Germany, Belgium, Prussia and Russia.

3. What imports do we obtain from Ceylon, New Zealand, British Guiana, Natal, Honduras, Trinidad, British Columbia, and Further India?

Ceylon.—Cinnamon, cloves and other spices, coffee, pearls.
New Zealand.—Wool, wheat, timber, flax, tallow, hides, and meat.
British Guiana.—Sugar, rum, timber, cotton, coffee, tobacco, indigo, ginger and maize.
Natal.—Ivory, sugar, wool, hides, horses, arrowroot.
Honduras.—Mahogany and logwood.
Trinidad.—Sugar, molasses, rum, cocoa, spices.
British Columbia.—Gold, silver, plumbago and other minerals, timber, fish.
Further India.—Rice, sugar, cotton, cinnamon and other spices, teak and other woods.

4. When it is 12 o'clock mid-day in London the time at New York is about 7 a.m. How can you explain this?

The earth is round, and revolves from west to east. England is further east than America, and, therefore, nears the sun first. As the earth turns round once in 24 hours, and the earth is 360° round, it follows that the earth will travel 15° per hour. New York is 75° west of London, and so the time will be 5 hours (75° ÷ 15°) later than London time. If, therefore, it is 12 mid-day at London it will be 7 a.m. in New York.

SECOND PAPER.

Two hours and a half allowed.

Needlework.

FEMALES.

The needlework specimens will be collected by the Inspector one hour after the distribution of the examination paper.

Arithmetic.

MALES.

1. Find the simple interest on £850 12s. 6d. from 12th March, 1884, to 29th December, 1885, at 4 per cent. per annum.

From March 12th, 1884 to Dec. 29th, 1885 = 1 year 292 days.

$$\text{Int. for One year} = \frac{£850\ 12s.\ 6d. \times 4}{100} = £34\ 0s.\ 6d.$$

days days
365 : 292 :: £34 0s. 6d. : £27 4s. 4½d.
£34 0s. 6d. + £27 4s. 4½d. = £61 4s. 10½d. Ans.

2. A merchant puts £650 in a business and gains £30 17s. 6d. in six months; what per cent. per annum does he make?

Year's gain = £30 17s. 6d. × 2 = £61 15s.
£ £ £ s. £ s.
∴ 650 : 100 :: 61 15 : 9 10s. Ans.

3. If railway stock pays a dividend of 5½ per cent. what income would a person derive by investing £3685 in it at 137⅛, the usual brokerage being charged?

Price paid for stock = 137⅛ + ½ = £137⅝.
£ £ £ £
∴ 137⅝ : 100 :: 5½ : 4. Ans.

4. If A walks 29 miles in 6¾ hours, and B 30 miles in 7½ hours; supposing them to start together, and to walk in the same direction, in what time would one be 1½ miles before the other?

A goes per hour $\frac{29}{6\frac{3}{4}} = \frac{29}{1} \times \frac{4}{27} = \frac{116}{27}$ m.

B ,, ,, $\frac{30}{7\frac{1}{2}} = \frac{30}{1} \times \frac{2}{15} = \frac{4}{1}$ m.

Gain made by A in 1 hr. $= \frac{11}{30}^{\text{ft}} - \frac{2}{5}^{\text{ft}}$

$= \frac{232 - 225}{54}$

$= \frac{7}{54}$ m.

m. m. hr. hr.

$\therefore \frac{7}{54} : 1\frac{1}{2} :: 1 : \frac{9}{2}$. Ans.

History.

MALES AND FEMALES.

1. Who were our Norman kings? Give their names and dates, and sketch the character of one of them.

They were the descendants of Rollo, the sea king, who had left Scandinavia, and conquered the northern part of France, and as they were Norsemen the country came to be called Normandy. The conqueror of England, the first of our Norman kings, was William the fifth Duke of Normandy, to whom, it is said, the crown had been promised by Edward the Confessor. The Norman kings were :—

William I., the Conqueror	...	A.D. 1066—1087
William II., Rufus ...	...	1087—1100
Henry I., Beauclerc ...	...	1100—1135
Stephen, of Blois...	...	1135—1154

William the Conqueror possessed great personal courage, military skill and ability for government. He had a stubborn will, and was unscrupulous in matters affecting his own welfare. He was cruel and tyrannical in government, when his schemes were opposed. During his later days, he was very avaricious, and his temper was embittered by his troubles with his brother, sons, and nobles.

2. Who was Henry II.? Tell briefly what you know about his wife and children.

Henry II. was the son of Geoffrey Plantagenet and Maud, the daughter of Henry I. He succeeded to the throne of England on the death of Stephen. He married Eleanor, the divorced wife of Louis VII., of France, and she brought with her the county of Poitou and the Duchies of Aquitaine and Gascony as her portion. With her his private life was unhappy. Their sons were Henry, Richard, Geoffrey, and John.

These sons frequently rebelled against their father. Henry, the eldest, who had been led on by the nobles to revolt, died in 1183, imploring his father's forgiveness. Geoffrey was pardoned, but soon became estranged, and finally died in 1186. Richard revolted in 1188, and seeking the aid of Philip of France, invaded the French dominions of the English king. Henry was now ailing, and on seeing the name of his favourite son John among the list of nobles assisting Richard, he died of fever and grief in 1189. Richard became king, went to the Crusades, and died in 1199. John reigned from 1199 to 1216.

3. Mention any popular insurrections under Richard II. and Henry VI., and tell what occasioned them.

In Richard II.'s time there was a popular rising, which began in Essex and Kent under Wat Tyler and Jack Straw. The direct cause was the imposition of a poll tax on every person above fifteen years of age, and the insolent behaviour of a collector of the tax to Wat Tyler's daughter.

In the reign of Henry VI. the Duke of Suffolk roused popular indignation by giving up Anjou and Maine. On being impeached, he was ordered to leave the country for five years, but on his way he was intercepted and beheaded. The insurrection in Kent under Jack Cade followed. From Blackheath where they had assembled in great numbers, they sent a statement of their grievances to the king, which were, mainly—the mal-administration of government; the evil counsellors of the king; the extortions of the sheriff; the injustice of the *Statute of Labourers*; and the interference of the great men with the freedom of county elections.

Teaching.

Describe some common defects in writing, and the means you would adopt for amending them.

Some of the commonest defects in writing are in the formation and the height of letters in the lower standards, and in the want of neatness, cleanliness, and legibility in the other standards.

The defects in the lower standards are often the result of defective teaching. Classes have been too large, and imperfect supervision has taken place, and the habit of making letters wrongly has been acquired. The frequent use of the blackboard and much practice on properly ruled slates, with constant watchfulness will correct such faults as beginning *o*'s and *a*'s in the wrong place; crossing the line with looped letters in the wrong place, and crossing *t*'s badly; making *t*'s too long and *b*'s, *d*'s, etc., too short; making loops to the tops of *s*'s and faulty loops in *f*'s and *g*'s; forgetting to dot the *i*'s, and making the tops of *j*'s too long, and making bad capitals.

Hurrying over work, especially homework, often destroys neatness, cleanliness, and legibility in the upper class writing. The frequent use of double lined small hand, punishment by having the work done again, praise for well-doing, and pointing out of faults with the way of remedying them are means of getting rid of the defects.

Music.

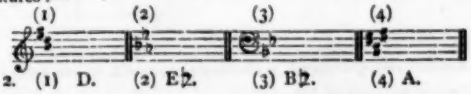
A quarter of an hour allowed for this paper.

OLD NOTATION.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation, or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

1. Write below each of the following intervals its name (major 2nd, &c.):—

2. State what major keys are shown by the following signatures:—



2. (1) D. (2) E♭. (3) B♭. (4) A.

3. Add *one* note to each of the following examples, to complete the bar in accordance with the time-signature:—

TONIC SOL-FA NOTATION.

1. What is the mental effect (1) of *fah*; (2) of *ray*; (3) of *te*?

1. (1) Grave, serious; (2) Expectant, prayerful if low, rousing if high; (3) Piercing, expectant.

2. Write the pulse-signs for six-pulse measure, and for nine-pulse measure:—

2. (1) | : : | : : ‖

(2) | : : | : : | : : ‖

3. What is the name of the interval between (1) *me* and *te*; (2) *fah* and *te*; (3) te_1 and *fah*?

3. (1) Major or Perfect 5th; (2) Pluperfect 4th or Tritone; (3) Minor or Imperfect 5th.

THIRD YEAR.

FIRST PAPER.

Pupil Teachers at end of Third Year.

Three hours and a half allowed.

Euclid.

MALES.

[All generally understood abbreviations for words may be used, but not symbols of operation, such as −, +, ×.]

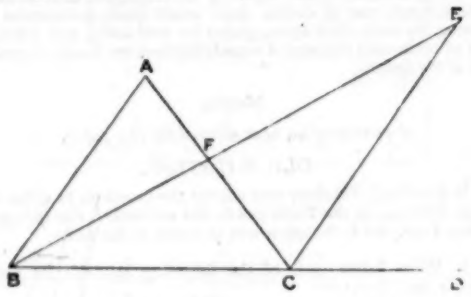
Answer two Questions, including Question 3, if you can.

1. If a straight line, falling on two other straight lines, make the alternate angles equal to each other; these two straight lines shall be parallel.

Euclid, Book I., Prop. 27.

2. Triangles upon the same base and between the same parallels are equal to one another.
Euclid, Book I., Prop. 37.

3. If the interior angle at one angular point of a triangle, and the exterior angle at another be bisected by straight lines, the angle contained by the two bisecting lines is equal to half the third angle of the triangle.



The ∠ ACD = ∠'s CBA, BAC (I. 32);
∴ ∠ FCE, which is half ∠ ACD (Constr.) = half the ∠'s CBA and BAC, *i.e.*, ∠'s FBA and half BAC.
And ∠ AFB = ∠ EFC (I. 15).
And the three ∠'s of each of Δ's ABF, CFE = two right ∠'s.
∴ Remaining ∠ FEC of Δ FEC = half ∠ BAF.—Q.E.D.

Algebra.

Answer two Questions, including Question 2, if you can.

1. Find the G.C.M. of $3x^4 - x^3y^3 - 2y^4$, and $10x^4 + 15x^3y - 10x^2y^2 - 15xy^3$.

$3x^4 - x^3y^3 - 2y^4)10x^4 + 15x^3y - 10x^2y^2 - 15xy^3$ (3

$30x^4 + 45x^3y - 30x^2y^2 - 45xy^3$ (10
$30x^4 \quad - 10x^3y^3 \quad - 20y^4$

$5y(45x^3y - 20x^2y^2 - 45xy^3 + 20y^4$
$9x^3 - 4x^2y - 9xy^2 + 4y^3)$

$)3x^4 - x^3y^3 - 2y^4$ (3

$9x^4 - 3x^3y^3 - 6y^4$ (x
$9x^4 - 4x^3y - 9x^2y^3 + 4xy^3$

$2y)\ 4x^3y + 6x^2y^2 - 4xy^3 - 6y^4$
$2x^3 + 3x^2y - 2xy^2 - 3y^3$ (9

$18x^3 + 27x^2y - 18xy^2 - 27y^3$ (2
$18x^3 - 8x^2y - 18xy^2 + 8y^3$

$35y)\ 35x^2y \quad - 35y^3$
$x^2 - y^2)9x^3 - 4x^2y - 9xy^2 + 4y^3$

$x^2 - y^2)9x^3 - 4x^2y - 9xy^2 + 4y^3$ (9x − 4
$9x^3 \quad - 9xy^2$
$- 4x^2y + 4y^3$
$- 4x^2y + 4y^3$

G. C. M. = $x^2 - y^2$

2. *Prove* the rule for dividing one fraction by another.

Divide $\frac{x+y}{x} - \frac{x^2+y^2}{x(y-x)} - \frac{2y}{x+y}$ by $\frac{x^2+y^2}{x^2-y^2}$

Let $\frac{a}{b}$ be divided by $\frac{c}{d}$. Let $\frac{a}{b} = x$ and $\frac{c}{d} = y$.

Then $a = bx$ and $c = dy$.
$\therefore ad = bdx$ and $bc = bdy$
$\therefore \frac{ad}{bc} = \frac{bdx}{bdy} = \frac{x}{y}$

But $\frac{x}{y} = x \div y = ab \div cd$.

$\therefore \frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc} = \frac{a}{b} \times \frac{d}{c}$

i.e., to divide one fraction by another invert the divisor and proceed as in multiplication.

$$\frac{x+y}{x} - \frac{x^2+y^2}{x(y-x)} - \frac{2y}{x+y} \div \frac{x^2+y^2}{x^2-y^2}$$
$$= \frac{-x^2+y^2-(x^2+y^2)}{x(y-x)} - \frac{2y}{x+y} \times \frac{(x-y)(x+y)}{x^2+y^2}$$
$$= \frac{-2x^2}{x(y-x)} - \frac{2y}{x+y} \times \frac{(x-y)(x+y)}{x^2+y^2}$$
$$= \frac{-2x^2(x+y) - 2xy(y-x)}{x(y-x)(x+y)} \times \frac{(x-y)(x+y)}{x^2+y^2}$$
$$= 2. \text{ Ans.}$$

3. Solve the equations:—

(1) $\frac{2x+1}{29} - \frac{402-3x}{12} = -10\frac{1}{2}$

(2) $\frac{a(x-3)}{ax-2a} + \frac{b(x-4)}{bx-3b} = 2.$

(1) $\frac{2x+1}{29} - \frac{402-3x}{12} = -10\frac{1}{2}$
$24x + 12 - 11658 + 87x = -3654$
$111x = 7992$
$x = 72.$ Ans.

(2) $\frac{a(x-3)}{ax-2a} + \frac{b(x-4)}{bx-3b} = 2$
$\frac{a(x-3)}{a(x-2)} + \frac{b(x-4)}{b(x-3)} = 2$
$ab(x-3)^2 + ab(x-4)(x-2) = 2ab(x-2)(x-3)$
$ab(x^2-6x+9) + ab(x^2-6x+8) = 2ab(x^2-5x+6)$
$2ab(x^2-6x) - 2ab(x^2-5x) = 12ab - 17ab$
$-2abx = -5ab$
$x = \frac{5}{2} = 2\frac{1}{2}$. Ans.

Mensuration.

In a rectangular court 96 feet by 84, there are four oblong grass plots 22½ feet by 18 each; find the cost of paving the remaining part of the court at 8½d. per square yard.

Total area = 96 ft. × 84 ft. = 32 yds. × 28 yds. = 896 yds.
Area of plots = (22½ ft. × 18 ft.)4 = (7½ yds. × 6yds.)4 = 180 yds.
Area to be paved = 716 yds.
Cost = 716 × 8½d.
= £25 7s. 2d. Ans.

Arithmetic.

FEMALES.

1. Find the value of $(\frac{1}{8} + \cdot 75) + (\cdot 6 - \frac{1}{5}) + (\frac{4}{11} \div \frac{1}{7})$, and divide 80·64 by the sum of ·846 and $\frac{3}{10}$ of ·2916.

$(\frac{1}{8} + \cdot 75) + (\cdot 6 - \frac{1}{5}) + (\frac{4}{11} \div \frac{1}{7})$
$= (\frac{1}{8} + \frac{3}{4}) + (\frac{3}{5} - \frac{1}{5}) + (\frac{4}{11} \times \frac{7}{1})$
$= 1\frac{3}{8} + \frac{2}{5} + 1$
$= 2\frac{51}{110}$. Ans.

$80{\cdot}64 \div {\cdot}846 + \frac{3}{10}$ of ·2916
$= \frac{8064}{100} \div \frac{846-84}{900} + \frac{3}{10} \times \frac{2916-291}{9000}$
$= \frac{8064}{100} \div (\frac{762}{900} + \frac{2625}{9000})$
$= \frac{8064}{100} \times \frac{9000}{10170} = 5\cdot\dot{3}$. Ans.

2. A man's net income after paying income tax at 5d. in the £ is £662 17s. 11d. What is his gross income?

	d.	d.	£	s.	d.	£
235	:	240	::	662 17 11	:	677. Ans.

3. What do you understand by *Ratio* and *Proportion*?
Show clearly how a *Ratio* is measured, and the relation that *proportion* bears to *ratio*, giving an example in illustration of your answer.

Suppose an express train travel 15 miles in 20 minutes, and an ordinary train 20 miles in three-quarters of an hour, state the ratio of the speed of the express to that of the ordinary train.

Ratio is the relation which one number bears to another, the comparison being made by considering what multiple part or parts the one is of the other. Thus 6 bears a relation to 12, inasmuch as 12 is a multiple of 6.

Proportion is the equality of two or more ratios.

A ratio is measured by the fraction which has the first term (antecedent) of the ratio for its numerator, and the second term

(consequent) for its denominator. A proportion is formed when the terms of the two ratios are similar fractions. Thus:

4 : 6 :: 6 : 9 is made up of two ratios for $\frac{4}{6}=\frac{6}{9}$.

Express train rate per min. $=\frac{1}{15}=\frac{4}{60}$ m.

Ordinary " " " $=\frac{1}{19}=\frac{4}{76}$ m.

Ratio $=\frac{4}{60} : \frac{4}{76}$

$=45 : 16$.

4. What is the quotient after dividing the sum of ·00097, ·00459975, and ·00008 by 6·075?

·00097
·00459975
·00008
6·075)·00564975(·00093. Ans.
54675
18225
18225

Grammar.

1. 'The whole cavalcade paused simultaneously when Jerusalem appeared in view; the greater number fell upon their knees, and laid their foreheads in the dust, whilst a profound silence, more impressive than the loudest exclamations, prevailed over all; even the Moslems gazed reverently on what was to them also a holy city, and recalled to mind the pathetic appeal of their forefather: "Hast thou not a blessing for me, also, O my father?"'

Paraphrase this passage.

The whole of the company paused instantly as soon as the city of Jerusalem came in sight; most of the men knelt down, and bowed their heads to the ground, while the stillness which pervaded the assembly produced a more marked effect than the loudest outcries would have done. The Mahometans also gazed with awe and respect upon the city, which even they regarded as holy, and the sight of which brought to their minds the pitiful supplication of Esau: 'Hast thou not a blessing for me, also, O my father?'

2. Point out the subordinate sentences in it, analyse the two last, and also parse the last of them.

(1) When Jerusalem appeared in view.
(2) What (which) was to them a holy city.
(3) 'Hast thou not a blessing for me, also, O my father?'

ANALYSIS.

Sentence.	Kind of Sent.	Connective.	Subject.	Predicate.	Object.	Extension.
What was to them a holy city.	Adj. sent.	in rel.	which	was a holy city to them		
Hast thou not a blessing for me, O my father?	Noun sent., obj. to recalled		Thou, O my father	hast	a blessing (dir.) for me (ind.)	

Hast—irreg. trans. verb, act., ind., pres., sing., 2nd, agreeing with *thou*.
thou—pers. pro., 2nd sing., masc., nom. to *hast*.
not—adv. of neg., qual. *hast*.
blessing—com. noun, neut., sing., gov. by *hast*.
for—prep., showing rel. between *me* and *hast*.
me—pers. pro., masc., sing., 1st., obj., gov. by *for*.
also—cop. conj., joining '*Hast thou*,' etc., to preceding sentence.
O—interjection.
my—pers. pro., 1st pers. sing., masc., poss., gov. by *father*.
father—com. noun, masc., sing. nom. of address.

3. Point out also and explain the meaning of any Latin or English prefixes in this passage:—

ap—in appeared, *to*; L., to come forth to.
fore—in foreheads, *before*; E., the front part of the head.
pro—in profound, *forward*; L., forward, down to the depths.
im—in impressive, *into*; L., that which presses in.
ex—in exclamations, *out*; L., crying out.
pre—in prevailed, *very*; L., to be very powerful, to overcome.
re—in recalled, *back*; L., called back.
ap—in appeal, *to*; L., to call to, to bring before one's mind.
fore—in forefather, *before*; E.
re—in reverently, *intensive*; L., to feel much awe.

Geography.

(*Answer* two *questions and draw* one *map*.)

1. Draw a map of one of the following:—
(*a*) Africa, south of the Equator.
(*b*) Coast-line of Asia from the mouth of the Obi to the mouth of the Amoor.
(*c*) Arabia.

2. The mountain chains which enclose the Chinese Empire form the great watershed of Asia. Name the mountain chains, and show the truth of the statement.

The rivers of Asia flow northward to the Arctic Ocean, eastward to the Pacific, or southward to the Indian Ocean. The watershed between these river basins is formed by the Altai mountains, the Thian Shan mountains, and the Himalaya mountains, and these mountains not only encircle China, but also are the sources of nearly all the large rivers. The Obi, Yenisei, and Lena, or their tributaries, and the Amoor, all flow from the northern slope of the Altai; the Hoang-ho, the Yang-tse-kiang, and Canton flow eastward; the Bramahpootra, Indus, and Ganges, southward, from one or other of the ranges.

3. Where are the following towns, and for what are they noted—Zanzibar, Khartoum, Massowah, Port Elizabeth, Durban, Bathurst, Timbuctoo, Fez, and Tunis?

Zanzibar, east coast of Africa, on island 8 degrees south of the Equator, residence of the Sultan of Zanzibar; considerable trade.
Khartoum, at junction of White and Blue Nile, in Soudan; capital of Nubia; exports ivory, senna, gum arabic; trade in slaves; death of General Gordon, after a year's siege.
Massowah, on island in Red Sea, port of Abyssinia; exports ivory, musk, wax, and coffee.
Port Elizabeth, west of Algoa Bay, south coast of Cape Colony, seaport; exports wool, hides, and diamonds.
Durban, oldest town and seaport of Natal.
Bathurst, (1) 97 miles from Sydney, on Macquarie river, one of the largest towns of New South Wales.
(2) Seaport town, on island of St. Mary, on west coast of Africa.
(3) Town in New Brunswick, port.
Timbuctoo, on Niger; caravan trade between north and west Africa.
Fez, in Fezzan, North Africa; woollen, carpet, and morocco leather manufacture; capital of ancient Moorish kingdom.
Tunis, capital of Tunis, largest town in Barbary States; trades in silk, wool, and esparto grass.

4. How are winds and ocean-currents influenced by the heat of the sun?

The air is heated by the sun, expands and rises. To restore the equilibrium, the colder air flows towards the place where the air has been heated, and so winds are formed. In this way the trade winds constantly blow in the same direction north and south of the Equator. The monsoons, too, are influenced by the sun's position, following the course of the sun. Variable winds are also caused by the air being unequally heated.

Just as the air at the equator is heated and flows northward and southward, forming the trade winds, so the heat of the sun causes currents to flow from the equator to the poles. Thus, both winds and ocean-currents are caused by the sun's rays.

SECOND PAPER.

Two hours and a half allowed.

Needlework.

FEMALES.

The needlework specimens will be collected by the Inspector at the expiration of one hour after the distribution of the examination paper.

Arithmetic.

MALES.

1. If a merchant buys goods for £450, and sells $\frac{2}{3}$ of them at a gain of 5 per cent., and the remainder at a gain of 12 per cent., what is his average gain per cent. on the whole?

$\frac{2}{3}$ of £450 = £180
5 p.c. on £180 = £9
£450 − £180 = £270
12 p.c. on £270 = £32 8s.
Total gain = £9 + £32 8s. = £41 8s.
∴ £450 : £100 :: £41 8s. : £9 4s. Ans.

2. If a man, by investing £7200 in 4 per cent. railway stock, gets a dividend of £240, find the price of the stock, the usual brokerage being charged.

Cents. of stock bought = $\frac{24}{4}\frac{0}{2}$ = 60
Price of stocking, omitting brokerage = $\frac{7}{4}\frac{2}{3}\frac{0}{6}$ = 120
Actual price of stock = 120 − ½
= 119½. Ans.

3. Find the square root of ·2, and of ·162, each to four decimal places.

.22222222 (.4714 Ans.
16
87) 622
609
941) 1322
941
9424) 38122
37696
426

.162 (.4024 Ans.
16
802) 2000
1604
8044) 39600
32176
7424

4. Two trains, A and B, start from two towns 200 miles apart, travelling respectively 20 and 25 miles an hour. How long should A start before B so that when they meet A will have travelled 10 miles more than B?

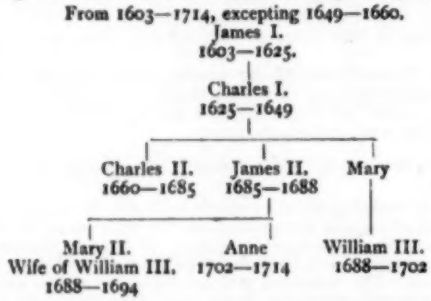
Distance to be travelled = A 105, B 95.
Time for A to travel 105 = $\frac{105}{20}$ = 5¼ hrs.
Time for B to travel 95 = $\frac{95}{25}$ = 3¾ hrs.
A should therefore start 5¼ − 3¾
= 1 hr. 27 mins. before B. Ans.

History.

MALES AND FEMALES.

1. For what period did sovereigns of the Stuart line fill the English throne? Show their relation in a genealogical table.

From 1603—1714, excepting 1649—1660.



2. When and under what circumstances did England lose large portions of her possessions in North America?

In the reign of George III. (1776—1781) England lost thirteen North American Colonies, which united under the name of the United States of America. The English Government attempted to tax the Colonies to defray the expenses of their protection. The Colonists denied the right of England to tax them. First the Stamp Act was passed, but repealed in a year. Taxes were laid on tea, as an assertion of the right of taxation. Much disturbance followed; cargoes of tea were thrown overboard at Boston; and as severe measures by way of punishment followed, the independence of the Colonies was declared on 4th of July, 1776. Disasters came upon the English arms; General Burgoyne had to surrender his forces in 1777; and then France, Spain, and Holland fought against England, while Russia, Sweden, and Denmark joined in an armed neutrality to resist the maritime law established by England. The war languished for a time, the English usually getting worsted during the campaigns; and the crowning disaster came when Lord Cornwallis and his army surrendered at York Town, 1781. George unwillingly recognised the United States the same year.

3. First of June, Camperdown, Cape St. Vincent, Nile, Trafalgar. What naval exploits do these names recall?

First of June.—Victory of Lord Howe over the French fleet in the English Channel on 1st June, 1794.

Camperdown.—Victory of the English, under Admiral Duncan, over the Dutch Fleet, under Admiral von Winter, off Camperdown, the fleet having the intention of invading Ireland.

Cape St. Vincent.—Sir John Jervis, with fifteen sail of the line, defeated the Spanish fleet of twenty-five, on the 14th February, 1797.

Nile.—August 1st, 1798, Admiral Nelson totally destroyed the French fleet lying in Aboukir Bay, only four French vessels escaping.

Trafalgar.—Nelson's last great battle, 21st October, 1805, in which the French and Spanish fleets were defeated off Cape Trafalgar, and in which Nelson received his death wound.

Teaching.

Write out the notes of a lesson on the uses of a colony.

Introduction.—Ask about friends of children in different parts of the world; some gone to Canada, Australia, or New Zealand. Why not stay in England? No work. Picture distress in large towns, and speak of agricultural labourers' low wages, poor cottages, etc. Better off in other countries.

Homes for Emigrants.—Why suitable? Land plentiful, cheap, fertile. Vast tracts of country will repay labour in felling trees, clearing soil, growing wheat, rearing sheep and cattle. Show adaptability of Canada, Australia, and Cape Colony for these purposes. Compare the scantiness of population with great numbers at home. Also prices of land here and in colonies.

Markets for Manufactures.—Colonies new, sparsely populated, profitable investments in land, no manufactures, hence needs supplied from mother country. Give statistics of trade, naming exports to colonies (iron, woollen, and cotton goods, boots and shoes, books, and other manufactured articles). In exchange we get gold, wool, hides, tallow, wheat, etc.

Minor Uses of Colonies.—Naval stations, as Hong Kong, Malta, Mauritius, Bermuda; trading stations, Singapore, West African towns; calling stations, at which water, coals, food, etc., can be obtained, Falkland Isles, Malta, Gibraltar, St. Helena, among the number.

Music.

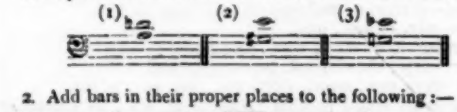
A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.

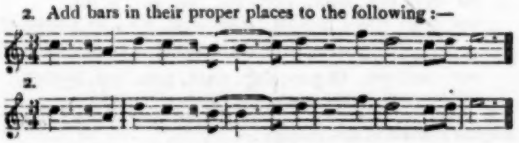
1. Write below each of the following intervals its name (minor 3rd, &c.):—

1. Perfect or Major 4th. Minor 6th. Minor 6th.

Transpose the above one octave lower in the Bass clef:—



2. Add bars in their proper places to the following:—

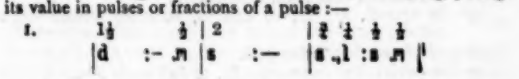


3. Explain briefly the following terms:—(1) *Largo*; (2) *Vivace*; (3) *Rallentando*; (4) *Tempo primo*.

3. (1) Broad and slow; (2) Lively, quickly; (3) Getting gradually slower; (4) In the original time.

TONIC SOL-FA NOTATION.

1. Write in figures over each note of the following passage its value in pulses or fractions of a pulse:—



2. Write the pulse-signs (1) for three-pulse measure, and (2) for nine-pulse measure :—

2.

(1) | : : ‖ (2) | : : | : : | : : ‖

3. State briefly the meanings of the following terms :—(1) *Largo* ; (2) *Vivace* ; (3) *Rallentando* ; (4) *Tempo primo.*

3. (1) Broad and slow ; (2) Quickly, lively ; (3) Getting gradually slower ; (4) In the original time.

FOURTH YEAR.

Pupil Teachers at end of Fourth Year.

FIRST PAPER.

Three hours and a half allowed.

Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

(*Answer two Questions, including Question* 3, *if you can.*)

1. Enunciate the first three propositions of Book II. ; show that the second and third propositions are particular cases of the first. Give the corresponding algebraical results.

(*i.*) If there be two straight lines, one of which is divided into any number of parts, the rectangle contained by the two straight lines is equal to the rectangles contained by the undivided line and the several parts of the divided line.

(*ii.*) If a straight line be divided into any two parts, the rectangles contained by the whole and each of the parts are together equal to the square on the whole line.

(*iii.*) If a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts is equal to the rectangle contained by the two parts together with the square on the aforesaid part.

In Prop. I. we have one straight line and several parts of a divided line ; in Prop. II. the side of the square is the undivided line, and the two parts of the divided side of the square may be considered the parts of the divided line ; in Prop. III. the larger part of the divided line is the undivided line, and the line divided into two parts stands for the divided line.

Algebraic formulæ :—

I. Let A contain x units and BC y units, and the parts a, b, c units respectively,

Then $y=a+b+c$.

Multiply each side by x,

Then $xy=xa+xb+xc$.

II. Let AB contain x units, and AC, CB y and z units,

Then $x=y+z$.

Multiply each side by x,

Then $x^2=xy+xz$.

III. Let AB contain x units, and BC y, and AC z.

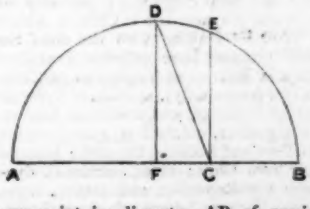
Multiply each side by y,

Then $xy=y^2+yz$.

2. In obtuse-angled triangles, if a perpendicular be drawn from either of the acute angles to the opposite side produced, the square on the side subtending the obtuse angle is greater than the squares on the sides containing the obtuse angle, by twice the rectangle contained by the side upon which, when produced, the perpendicular falls, and the straight line intercepted without the triangle between the perpendicular and the obtuse angle.

Euclid, Book II., Prop. 12.

3. From any point in the diameter of a semicircle two lines are drawn to the circumference, one to the middle point of the arc, the other at right angles to the diameter ; show that the squares on these lines are together double the square on the radius.



From C, any point in diameter AB of semicircle ADB, draw CD to D, the middle point of arc ADB, and CE at right angles to AB.

Then sqs. on CD, CE shall be double sq. on half AB.

From D draw DF perpendicular to AB. Join DC.

Then by joining AD, DB it may be shown that AB is bisected in F, for AD=DB, and ∠ DAF=∠ DBF (I. 5), and ∠ AFD=∠ BFD (Constr.). ∴ AF=BF.

And sq. on DC=sqs. on DF, FC (I. 47), and sq. on CE=rect. AC, CB (II. 14), and rect. AC, CB together with sq. on FC =sq. on FB,

∴ sqs. on DC, CE=sqs. on DF, FC and rectangle AC, CB, that is, twice sq. on AF.—Q.E.D.

Algebra.

(*Answer two Questions, including Question* 2, *if you can.*)

1. Find the value of $\frac{x+y-1}{x-y+1}$ when $x=\frac{a+1}{ab+1}$ and $y=\frac{ab+}{ab+1}$

$$\frac{x+y-1}{x-y+1}$$

$$= \frac{\frac{a+1}{ab+1}+\frac{ab+a}{ab+1}-1}{\frac{a+1}{ab+1}-\frac{ab+a}{ab+1}+1}$$

$$= \frac{\frac{a+1+ab+a-(ab+1)}{ab+1}}{\frac{a+1-ab-a+ab+1}{ab+1}}$$

$$= \frac{\frac{2a}{ab+1}}{\frac{2}{ab+1}}$$

$$= \frac{2a}{ab+1}\times\frac{ab+1}{2}$$

$$= a. \text{ Ans.}$$

2. Prove that if c be a common measure of a and b it will also measure $ma+nb$ and $ma-nb$, where m and n are any quantities.

Let c be contained p times in a and q times in b ; then $a=pc$, and $b=qc$, and $ma+nb=mpc+nqc=(mp+nq)c$.

∴ c is contained in $ma+nb$ $(np+nq)$ times, and therefore c measures $ma+np$.

It also measures $ma-nb$, for $ma=mpc$ and $nb=nqc$, and $ma-nb=mpc-nqc=(mp-nq)c$; that is, $ma-nb$ is measured $(mp-nq)$ times by c.

Find (by inspection, if you can) the G.C.M. of x^6-x^5-3x+3 and x^6-2x^5-3x+6.

$$x^6-x^5-3x+3=(x^5-3)(x-1)$$
$$x^6-2x^5-3x+6=(x^5-3)(x-2)$$
$$\text{G.C.M.}=x^5-3. \text{ Ans.}$$

3. Solve the equations :—

$$\left.\begin{matrix}(1)\ 22x-19y=58\\ 27{\cdot}5x-9y=249{\cdot}5\end{matrix}\right\}$$

(2) $323x^2+2x=1$

(1) $22x-19y=58$ (i.)
$27{\cdot}5x-9y=249{\cdot}5$ (ii.)

Multiply (i.) by 5 and (ii.) by 4.

$$110x-95y=290$$
$$110x-36y=998$$
$$-59y=-708$$
$$y=12. \text{ Ans.}$$

$$22x-19y=58$$
$$22x-228=58$$
$$22x=286$$
$$x=13. \text{ Ans.}$$

(2) $323x^2+2x=1$

$$x^2+\tfrac{2}{323}x=\tfrac{1}{323}$$

$$x^2+\tfrac{2}{323}x+(\tfrac{1}{323})^2=\frac{1}{(323)^2}+\tfrac{1}{323}$$

$$=\frac{324}{(323)^2}$$

$$x+\tfrac{1}{323}=\pm\tfrac{18}{323}$$

$$\therefore x=-\tfrac{1}{323}\pm\tfrac{18}{323}$$

$$\therefore x=\tfrac{17}{323}, \text{ or } -\tfrac{19}{323}. \text{ Ans.}$$

Mensuration.

(*Answer one Question.*)

Let the perimeter of the equilateral triangle be $3a$; that is, let its side be a.

Then its area is $\frac{a^2\sqrt{3}}{4}$

If the perimeter of a square is $3a$ its side is $\frac{3a}{4}$, and its area is $\frac{9a^2}{16}$.

Hence area of triangle : area of square

$$:: \frac{a^2\sqrt{3}}{4} : \frac{a^2 9}{16}$$
$$:: \sqrt{3} : \frac{9}{4}$$
$$:: 1 : \frac{9}{4\sqrt{3}}$$
$$:: 1 : \frac{9\sqrt{3}}{12}$$
$$:: 1 : \frac{3\sqrt{3}}{4}$$

2. Find the area of a circular ring whose inner and outer diameters are 13 ft. 8 in. and 7 ft. 6 in.

13 ft. 8 in. + 7 ft. 6 in. = 21 ft. 2 in.
13 ft. 8 in. − 7 ft. 6 in. = 6 ft. 2 in.
21 ft. 2 in. × 6 ft. 2 in. × ·7854
= 254 × 74 × ·7854
= 14762·3784 in.
= 102 ft. 74·3784 in. Ans.

Arithmetic.

FEMALES.

1. What sum of money invested for five years at 6 per cent. simple interest will amount to £171 0s. 3d.?

£100 in 5 years at 6 per cent. will become £130.

£ £ s. d. £ £ s. d.
130 : 171 0 3 :: 100 : 131 10 $11\frac{7}{13}$. Ans.

2. Explain the difference between *Stock* and *Money*. What is the meaning of stock being *at par*? If I buy 3 per cent. stock at 85, what rate per cent. do I get on the investment?

'Money' is gold and silver. 'Stock' is the name given to money lent to a Government or a company at a given rate of interest. The selling price of the stock may vary from time to time with the credit of the country, the general rate of interest, etc.

Stock is 'at par' when the original price has to be paid for an amount of stock. Thus, if £100 stock could be bought for £100, then the stock would be said to be 'at par.'

Here £3 is received for every £85 invested,

£ £
∴ rate per cent. = 85 : 100 :: 3 : $3\frac{6}{17}$. Ans.

3. Twelve men agree to build a house in 45 days, working 10 hours a day; three of them, however, are unable to work, and the rest are obliged to work two hours a day less time. In how many days will the house be finished?

No. of hours' work = 12 × 45 × 10
= 5400

Hours per day by men actually employed } = 9 × 8 = 72

No. of days = $\frac{5400}{72}$ = 75 days. Ans.

4. A train leaves London at 10 a.m., and arrives in Manchester (188 miles) at 2.40 p.m.; a second train leaves London at 10 a.m., and arrives in Liverpool at 5.5 p.m.; the average rate of first and second trains being as 17 to 14. Find the number of miles between London and Liverpool.

hrs. m. m.
Time taken by first train = 4 40 = 280
,, second ,, = 7 5 = 425
miles miles
∴ min. 280 : 425 :: 188 : 235. Ans.
rate 17 : 14

Grammar.

"And O, ye swelling hills, and spacious plains!
Besprent from shore to shore with steeple-towers,
And spires whose silent finger points to heaven;
Nor wanting, at wide intervals, the bulk
Of ancient minster lifted above the cloud
Of the dense air, which town or city breeds
To intercept the sun's glad beams—may ne'er
That true succession fail of English hearts,
Who, with ancestral feeling can perceive
What in those holy structures ye possess
Of ornamental interest."

Paraphrase this passage.

I pray that England may never want for men so imbued with love for that which is venerable as to perceive all that is lovely in the churches dotted over the hillsides and valleys of our country, whose tapering spires point upward to the skies or whose massive towers lift themselves up above the clouds of smoke which hang o'er every town and city, intercepting the bright rays of the sun in their passage to the earth.

2. Point out in it the subordinate sentences, and analyse and parse fully the last sentence.

(1) Whose silent finger points to heaven—Adj. sent. to *spires*.
(2) Which town or city breeds to intercept the sun's glad beams—Adj. sent. to *air*.
(3) Who with ancestral feeling can perceive what of ornamental interest—Adj. sent. to *hearts*.
(4) What in these holy structures ye possess—Noun sent., obj. to *perceive*.

Subject: ye.
Predicate: possess.
Object: what.
Extension: in these holy structures.

What—Compound rel. pro., including antecedent and relative = *the things which*. *Things*, com. noun, plur., neut., 3rd obj., gov. by *perceive*; *which*, rel. pro., neut., plur., 3rd. obj., gov. by *possess*.
in—prep., showing rel. between *structures* and *possess*.
these—disting. adj., plur., limiting *structures*.
holy—adj. of quality, qual. *structures*.
structures—com. noun, neut., plur., obj., gov. by *in*.
ye—pers. pro., 2nd pers. plur., neut., nom. to *possess*.
possess—reg. trans. verb, act., ind., pres. 2nd plur., agreeing with its nom. *ye*.

3. What kinds of English words are derived from the Anglo-Saxon language? State any difference in inflection between the English and Anglo-Saxon languages.

Most of our monosyllabic words were derived from Anglo-Saxon, also nearly all our conjunctions, numerals, prepositions, all our pronouns and demonstrative adjectives, the words which undergo vowel changes, as *mouse, foot, come, swim, must*; the irregularly compared adjectives, and nouns with plurals formed by *en* and *ves*; words which begin with *wh, kn, gn, gl*, and *th.*; words with true English prefixes and affixes, as *unrest, friendless, entrust, brooklet*; the majority of names of natural objects, of the parts of the body, feelings, and states of the mind.

In modern English many of the Anglo-Saxon inflexions have become obsolete or lost. Adjectives had terminations, as *god-an, good*; noun plurals had *es* where E. has only *s*, as *smith-es, smiths*; *e* took the place of the present apostrophe in the possessive, as *smith-es* for *smith's*; verbs had syllables which have entirely dropped, as *luf-iath* for *love*.

Geography.

(Answer *two* questions and draw *one* map.)

1. Draw a map of one of the following:—
(*a*) The basin of the Mississippi.
(*b*) The Japanese Islands.
(*c*) The coast-line of North America, from Behring's Strait to the Isthmus of Panama.

2. Name an island, a river, a strait, a gulf, an estuary, a range of mountains, and a tableland on the line of the Equator.

Island, Sumatra; river, Amazon; strait, Malacca; gulf, Gulf of Guinea; estuary, Amazon; range of mountains, Andes; tableland, Central Africa.

3. 'Shipping Intelligence, Liverpool:—

'The Pacific Steam Navigation Company's steamer Aconcagua, from South American ports, arrived here this morning.'

From what has this steamer derived its name, what ports may it have visited, and what cargo will it probably contain?

The name is that of a mountain in Chili, S. America, the highest in the New World. Trading with the chief South American ports, it would probably have called at Truxillo and Callao in Peru, at Cobija in Bolivia, at Valparaiso in Chili, at the Falkland Islands (for letters only), at Buenos Ayres or Monte Video in the Argentine Republic, and at Rio de Janeiro in Brazil.

It would bring silver, quicksilver, guano, quinine, and nitrate of soda from Peru and Bolivia; the same minerals and arsenic and antimony from Chili; hides, cochineal, dye-woods, resins, and silver from the Republic; and cotton, sugar, coffee, hides, logwood, gums, drugs, and diamonds from Brazil. This would make a very general cargo. A special cargo would consist of only a few of these.

4. What is meant by spring tides, neap tides, and a tidal "bore"?

Spring tides are formed when the attraction of the sun is added to that of the moon in forming the tides. They rise to a great height, and ebb also a great distance.

Neap tides are formed when the attraction of the sun is exerted at right angles to that of the moon. They neither rise so high nor ebb so low as spring tides.

Spring tides occur every fortnight. Neap tides also occur each fortnight, on opposite weeks from spring tides.

A tidal "bore" is formed when the passage which the tidal wave enters gradually narrows, and the tide meets the current of the river and a conflict ensues between the opposite currents.

SECOND PAPER.

Two hours and a half allowed.

Needlework.

FEMALES.

The needlework specimens will be collected by the Inspector at the expiration of one hour after the distribution of the examination paper.

Arithmetic.

MALES.

1. If a man sells tea at 2s. 8d. per lb., he will lose 4 per cent.; at what price should he sell it so as to gain 8 per cent.?

Selling price of £100 to lose £4 = £96.

∴ 96 : 108 :: 2s. 8d. : 3s. Ans.

2. A man insured a ship worth £10,000 to the extent of ¾ of its value by paying £3 2s. 6d. per cent. on the amount insured. The ship being lost, how much was the man better by having insured than if he had not insured at all?

¾ of £10,000 = £7500

£7500 at 3½ per cent.

= £234 7s. 6d.

He is therefore better off by £7500 less cost of insurance, £234 7s. 6d.,

that is, £7265 12s. 6d. Ans.

3. Distinguish between true and banker's discount. If a person takes a bill for £850 to a banker to be discounted, what money will he get for it, the rate of discount being 3½ per cent.?

True discount is the interest on the present worth, and is such a sum as added to the present worth would make the debt; banker's discount is the interest on the debt itself; the banker thus deducts more than the true or real discount.

£850 at 3½ per cent.

= £29 17s. banker's discount.

£850 − £29 17s. = £820 3s. Ans.

4. State the rule for converting a mixed recurring decimal into a vulgar fraction.

Convert $\cdot 3214\dot{5}$ and $\cdot 01\dot{3}2\dot{5}$ into vulgar fractions in the lowest terms.

Write down the decimal fraction to the end of the first period, and subtract from it all the figures which do not circulate; the remainder is the numerator. For the denominator write as many 9's as there are figures circulating, followed by as many 0's as there are figures which do not circulate.

$$\cdot 3214\dot{5} = \frac{32145 - 321}{99000} = \frac{31824}{99000} = \frac{3536}{11000} = \frac{442}{1375} \text{ Ans.}$$

$$\cdot 01\dot{3}2\dot{5} = \frac{1325 - 1}{99900} = \frac{1324}{99900} = \frac{331}{24975} \text{ Ans.}$$

History.

MALES AND FEMALES.

(*Answer two Questions.*)

1. War between England and France, of which we read little before the Conquest, was common after that event; how would you explain this?

The two nations knew little of each other before the Conquest, and had little to do with each other, each having sufficient occupation at home. When William came over to England and conquered it, still retaining possession of his dominions in France, and being a vassal of the French king, jealousy would be engendered, and it would dispose the French king to seek every occasion to quarrel with his vassal to oust him from his dominions. The French wars were nearly always to maintain or regain possession of provinces belonging to the English sovereign.

2. 'Queen Elizabeth, who bears the character of a capricious woman, was the most steady sovereign in her politics;' give instances of Elizabeth's personal caprice and political steadiness.

Elizabeth's conduct towards Mary Queen of Scots may be cited as an instance of her not knowing her own mind. She affected to be her friend, to mediate with her people, and yet kept her in prison, ultimately beheaded her, and then expressed sorrow and anger that her wish had been obeyed. Sometimes she had one favourite, sometimes another; now it was Sir Walter Raleigh, now Earl of Leicester, now Earl of Essex. Although pretending to be determined to live and die a virgin queen, she entered into a marriage agreement with the Duke of Anjou, and, some say, had made up her mind to marry Leicester. The one ruling principle in Elizabeth's policy was enmity towards Spain, determination to maintain her own power and to further the interests of her country. She fought Spain, helped the people of the Netherlands against Spain, and assisted distressed nations. She encouraged colonization, trade, and commerce.

3. The Duke of Shrewsbury died in 1717, W. Penn in 1718, Joe Addison in 1719, the Duke of Marlborough in 1722; narrate what history tells of any two of these persons.

The Earl of Shrewsbury joined the Prince of Orange on his landing in England, and after William's acceptance of the throne became State Secretary to the king, and was accused of holding communication with James. He was made Lord Chamberlain under Queen Anne, and Premier by her on her deathbed. He died three years afterwards.

Joseph Addison was a prose writer and poet, who delighted the public with papers on social and other topics in the *Spectator*. He had received a pension of £300 a year, with which he was to travel on the Continent and prepare for diplomatic life. He was made a Commissioner of Appeals, and afterwards Secretary of State for Ireland. He wrote political pamphlets, the *Tatler*, the *Guardian*, and several poems.

4. 'If the victory at Trafalgar cost England the life of Nelson, the defeat on the plain of Austerlitz deprived her counsels of the presence of Pitt.' Explain fully the historical allusions.

At the battle of Trafalgar Lord Nelson was killed. He had fought England's naval battles with success for many years, and his death was a great loss to the British nation. He was killed on board the *Victory* on the 21st Oct., 1805. Early in the next year William Pitt, who had been foremost in the councils of the nation, who had at home directed or influenced all the operations against Napoleon Bonaparte, died broken-hearted when he heard of the victory of Bonaparte over the Austrians and Russians at Austerlitz (Dec. 2nd, 1805). Hopes had been entertained that the coalition against Napoleon would have successfully broken his power; these hopes were dashed to the ground by the result of the battle. The result was disastrous to this country by causing the decease of the great statesman.

Teaching.

Write out the notes of a lesson on the Post Office.

Relate instance of Sir Rowland Hill seeing a woman refuse a letter because of the cost of postage. His determination to reduce the cost. Introduction of Penny Post.

Post Office a Government Department.—Government controls Post Office, establishes offices in towns, villages, hamlets, erects pillar-boxes, wall-boxes, pays all servants, and finds everything connected with the service. Government alone issues stamps to prepay letters, issues regulations for service, receives payment for stamps, and pays all persons employed.

General Post Office.—Heads of Government Department connected with one office, the General Post Office, in Aldersgate Street, London. The Chief of Department called Postmaster-General. Branch offices send letters to G.P.O., whence despatched to destination. Large towns have general post-office also, and deal with all local letters. Describe scene at G.P.O. at time for closing mail, 6 p.m.

Employés.—Sorters, stampers, postmen, van-men, clerks, assistants, etc. Describe duties of each, by following a letter through the Post Office to its destination by road, rail, and sea; notice office-stamp, why used.

Other Branches of Post Office Duties.—Telegraphy, money-order business, savings bank.

These can only be mentioned, and must form matter for separate lessons.

Advantages.—Cheapness, rapidity of delivery, safety, employment for many people.

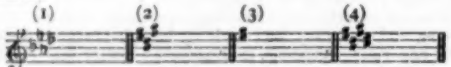
Music.

OLD NOTATION.

A quarter of an hour allowed for this paper.

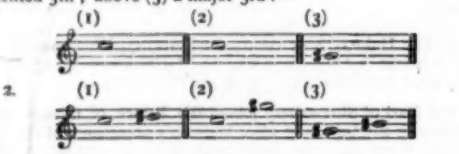
(N.B.—Pupil Teachers may answer the question in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

1. State what *minor* keys are shown by the following signatures :—

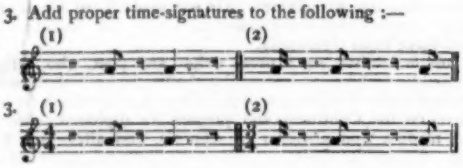


1. (1) F. (2) F♯. (3) E. (4) C♯.

2. Write above (1) an augmented 2nd ; above (2) an augmented 5th ; above (3) a major 3rd :—



3. Add proper time-signatures to the following :—



TONIC SOL-FA NOTATION.

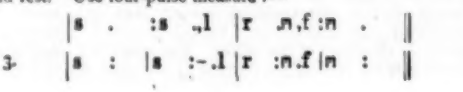
1. Write (1) above *doh*^{1} an augmented 2nd ; (2) above *soh* an augmented 5th ; and (3) above *fe* a diminished 3rd.

1. (1) *re*^{1} ; (2) *re*^{1} ; (3) *la*.

2. Which two notes of the scale are most commonly altered, and what are their chromatic names?

2. *Fah* and *te*. They become respectively *fe* and *ta*.

3. Re-write the following, doubling the value of every note and rest. Use four-pulse measure :—



The 'Practical Teacher' Sale and Exchange Column.

Owing to numerous requests, we have been induced to start this Exchange Column for the benefit of our readers. We shall be glad to insert announcements relating to the 'Sale or Exchange' of books, etc., at the rate of One Penny per Line, *prepaid.*

For Sale:—Huxley's Physiography, 4s. (quite new) ; Tate's Physical and Historical Geology, 3s. Address—George Beard, St. Blazey Gate, Par, Cornwall.

Chambers's German Dictionary, 2s. 3d. ; James's ditto, 2s. 9d. ; Smith's Initia Græca, Part II., 1s. 10d. ; Jelf's Greek Grammar, 2 vols., published 30s. (offers ?) ; Griffith's School Management, 8d.—all nearly new ; Arnold's Greek Grammar, 2s. 6d. ; Peile's Philology, 7d. ; Livy, Book I., 1s. 9d., published 6s. ; free.—James Cameron, British Schools, Wylam-on-Tyne.

For Sale:—Richardson's 5s. Geography (edited by Dr. W. Smith), 3s. 4d. ; Cornwell's 5s. 6d. Geography (with maps), 3s. ; Smith's Principia Latina, 2s. ; Cornwell's School Atlas, 1s. 6d. ; McLeod's Analysis of Sentences (new), 1s. ; Sanderson's History of British Empire (428 pages), 1s. 8d. ; Hunter's Treatise on Logarithms, with Key, 1s. ; Mayor's Greek for Beginners, with extensive vocabulary, 3s. 2d. Carriage paid.—H. Priestland, Andreas, Isle of Man.

Brown's Self-interpreting Family Bible, gilt edges, cost 30s. good as new, will sell for 16s. ; Arnold's Greek Prose Composition (5s. 6d.) for 2s. 6d, ; Græcæ Grammaticæ (2s. 6d.) for 1s. 3d. ; Latin Verse Book (2s. 6d.) for 1s. 3d. No cards.—Schoolmaster, Redington, Haverhill.

List of books for Matriculation. (Stamped envelope.)
Wormell's Natural Philosophy, 4s. 6d., for 1s. 6d.
Todhunter's Mechanics, 4s. 6d., for 1s. 6d.
History of Herodotus (Oxford Classics, 3s.) for 1s.
Homer's Odyssea (Oxford Classics, 3s.) for 1s.
Student's Guide to Cambridge University, 5s., now 1s.
Deschanel's Natural Philosophy, Mechanics, etc., and Light, etc., published at 4s. 6d. each, now 2s. 6d. each.
List of books for 1st B.Sc. Mathematics. (List, stamp.)
Hughes' Modern Geography, 3s., for 1s. 6d.
Bradley's Lessons in Latin Prose, 3s., and Exercises, 3s., for one-third ; Wilkin's Latin Prose, 5s. 6d., for 1s. 6d. ; London Science Examinator, 1s., for 3d.
List of Books for 1st B.A., Mathematics. (List, stamp.)
Wanted :—London University Calendars, 1870—83, except '75, '77, and '82. [1st B.A., 1, Little Templar Street, Leeds.]

Wanted, latest editions:—Havet's Complete French Class Book ; Guthrie's Electricity ; Huxley's Biology ; Oliver's Botany ; Stewart's Physics. Will sell or exchange books for which have no use. Send list of wants.—C. Turner, 132, Cleethorpes Road, Grimsby.

For Sale:—Hogarth's Complete Works, half morocco, thick handsome volume, size 12 by 9, price 30s. ; National Gallery, over 200 plates, cloth gilt, 16 by 12, 42s. (seven divisions) ; History of Highlands, Highland Clans and Regiments (eight divisions), with coloured plates of Tartans, other plates and woodcuts, 24s. ; Chambers's Cyclopædia, ten vols., half calf (binding bad). 45s. Various School Histories, Grammars, etc., list for stamp.—Schoolmaster, 74, Bury Old Road, Manchester.

For Sale:—
Eight glass stoppered bottles (four ½-gal., three 1-qt., and one 1-pt.), 7s. 6d.
Three Leclanché cells (pints), 2s. 6d. each.
One pair telephones, 7s. 6d. the pair
Two inch shocking coils, 10s. each.
One magneto-electric machine, 5s.
One ebonite plate, 16 in. by ¼ in., 10s.
Two earthenware plating baths, white inside, 17 in. by 14 in. by 7 in., 5s. each.
P.S.—The whole for £3, purchaser to pay carriage.
Apply—Mr. J. H. Pryce, Cockerton, Darlington.

GOOD CHANCE FOR PUPIL TEACHERS.

For Sale:—The following books, at prices stated. Published prices also given in most cases. All perfect and in thoroughly good condition.

	£	s.	d.
Blackie's Popular Encyclopædia, 14 vols., quite new and unsoiled, £7 14s.	5	0	0
Barnes on New Testament, 11 vols., new, 34s. 6d.	1	2	0
Boy's Own Paper, 44 monthly parts ; Nos. 37 to 80 inclusive, 22s.	0	12	0
Cassell's Popular Educator, new and revised edition, 39 vols., complete, 19s. 6d. (quite new)	0	12	0
Ross's Manual of English History, 5s. 6d. ...	0	3	0
The Student's Hume, 7s. 6d...	0	4	0
Michel's French Grammar, 3s. (new) ...	0	1	8
Currie's Common School Education, 6s. ...	0	3	0
Page's Advanced Text-Book of Geology (new), 7s. 6d.	0	4	3
Rev. C. A. John's 'Flowers of the Field,' 7s.	0	4	0
Lees' Acoustics, Light and Heat, 2s. 6d. ...	0	1	6
,, ,, ,, (elementary), 1s.	0	0	6
Reid's English Dictionary, 5s 6d.	0	2	6
Ansted's Physical Geography (advanced) ...	0	2	6
Shakespeare (Macmillan), 3s. 6d.	0	1	9
Milner's History of England, 5s.	0	2	6
Lawson's Geography of British Empire, 3s.	0	1	3
Hewitt's Geography of British Colonies ...	0	0	9
Page's Advanced Physical Geography, 5s. ...	0	2	6
Daniel's Outlines English History, 2s. 6d. (new)	0	1	6
Lawson's Geography of River Systems, 1s...	0	0	6
,, ,, ,, Coast-lines, 1s. ...	0	0	6
Colenso's Arithmetic	0	1	0

	£	s.	d.
Mackay's Elements of Geography, 3s. ...	0	1	6
Huxley's Lessons in Elementary Physiology, 4s. 6d.	0	2	6
Ince & Gilbert's Outlines Eng. History, 1s. 6d.	0	0	9
Dickinson's Practical Grammar, 1s.	0	0	6
Currie's Elements Musical Analysis, 4s. 6d...	0	2	0
Morrell's Grammar and Analysis, and Graduated Exercises	0	1	6
Gill's School Management, 3s.	0	1	6
,, Notes of Lessons	0	1	3
Barnard Smith's Arithmetic, 4s. 6d... ...	0	2	0
Clyde's School Geography, 4s.	0	1	6
Berchall's England under Normans and Plantagenets	0	2	6

Also lot of other good books, equally cheap. Lists on application to H. Mann, Board Schools, Exmouth.

Publications Received.

Bell (G.) and Sons—
Livy. Book XXI. Edited by the Rev. Launcelot Downing Dowdall, M.A.

Blackie and Son—
Miss Grantley's Girls. By T. Archer.
Tom Finch's Monkey. By J. C. Hutcheson.
My Mistress the Queen. By Miss Paull.
The Congo Rovers. By Harry Collingwood.
Through the Fray. By G. A. Henty.
The Differential and Integral Calculus. By Millar.
Modern Geographical Names. By G. G. Chisholm, M.A. B.Sc.
The Pedlar and His Dog. By Miss Rowsell.
The Penang Pirate. By J. C. Hutcheson.
The Dragon and the Raven. By G. A. Henty.
Brownsmith's Boy. By G. Manville Fenn.
A Terrible Coward. By G. Manville Fenn.
Little Tottie. By T. Archer.

Cassell and Co., Limited—
Shakspere's Plays: Julius Cæsar. Coriolanus.

Chambers (W. and R.)—
Chambers's Geographical Reader. Standard VI.
A Biographical History of English Literature (Dr. Morell's Series).

Educational Supply Association, The—
The Viaduct Series of Copy Books. Nos. 1 to 11.
Moral Picture Lessons—Kind and Tidy Children. Cruelty to Animals. Dishonest, Untidy Children, and Mockers. Industrious Children. Danger of Stone-throwing and Pilferers. Danger of Playing with Fire.
The Kinder-Garten Drawing Books. Nos. 1 and 2.

Heywood (John)—
How to Pass Ninety per Cent. and Earn 'Excellent.' By One who does it.
Local Examination History. By Dr. R. S. Pringle.

Hodder and Stoughton—
Dot: The Story of a City Waif. By Annie Lucas.
Stirring Stories of Peace and War. By Dr. Macaulay, M.A., M.D.
Fritz and Eric; or, The Brother Crusoes. By J. C. Hutcheson.
A Little Silver Trumpet. By L. T. Meade.
Dessie Fennimore. By Kate Hutton.
The True Woman. By W. H. Thayer.
Thrown on the World. By Edwin Hodder.

Inglis (W.) and Co. (Melbourne)—
Once a Month. September.

Jarrold and Sons—
The Teacher's Diary and Pocket Book.

Johnston (W. and A. K.)—
Natural History Plates. Lion and Tiger.
Large Wall Illustration of Chemistry. Sheet V., with Handbook.
Large Wall Map of West India Islands, with Handbook.

Letts, Son, and Co., Limited—
Letts's Illustrated Household Magazine. November.

Longmans and Co.—
Longman's Geographical Reading Books. Animal Life on the Globe.
Longman's Magazine. November and December.

Lund (Percy) and Co.—
Wise Sayings. By Percy Lund.

Nelson (T.) and Sons—
Archie Digby. By G. E. W.
Salome. By Mrs. Emma Marshall.
Famous Caves. By W. H. Davenport Adams.

Philip (G.) and Son—
Musical Theory Course. By John Taylor.

Rivingtons—
A First Course of Physical Laboratory Practice. By A. M. Worthington, M.A.

Smith, Elder and Co.—
The Cornhill Magazine. November.

Whittaker and Co.—
Lange's German Classics. Auf Wache: Der Gefrorene Kuss. Edited by A. A. Macdonnell, M.A., Ph.D.

Wilson (W.) (Dewsbury)—
The Practical Drawing Copies. By W. Wilson. Sets I. and II.

Publications Reviewed.

PRIZE BOOKS.

Messrs. Blackie and Co.'s List.

Second Notice.

We have two more parcels of prize books from these enterprising publishers to acknowledge and notice. They vary in size from volumes of nearly 400 pages to pretty little books of fifty and sixty, and are adapted for children of nearly all ages.

The most important of the larger volumes is

(1) **Two Thousand Years Ago**; or, The Adventures of a Roman Boy. By Prof. A. J. Church.

This charming book has twelve full-page illustrations by Adrian Marie, which are scarcely worthy of it. The artist could not have read the story before he pretended to illustrate it, or he would not have drawn a lad of seventeen with a heavy beard, etc., as if he were a man of twice the age.

In the preface, the professor tells us exactly the condition of the Roman Empire at the time (72 B.C.) when the story opens. The hero is brought into connection with several of the leading or well-known people of that time—to wit, amongst others, Spartacus, the gladiator, and Mithridates, the king of Pontus, by both of whom he is taken prisoner. The writer concludes his happily-written preface with these words: 'A writer who has been engaged in teaching for the greater part of his life can hardly help trying to make his book useful. I hope, however, that my young readers will not find this story less entertaining, because it may help them to realise the period to which it belongs.' Adding, humbly, 'They will not find it overloaded with learning—a fault which, indeed, it is only too easy for most of us to avoid.'

To the first part of this we gladly assent. No boy could read the book without considerably increasing his knowledge of this critical period of Roman history, though the story never stops to give an opportunity for an historical essay, as one so often finds in this class of fiction.

(2) **Gytha's Message.** A Tale of Saxon England. By Emma Leslie.

This is a pretty story of a brother and sister, who are introduced to us as slaves being driven, together with others, into Bristol. They had been wrecked as they returned from Flanders, and thus fallen into the hands of the dealers. As they entered the city a gay cavalcade met them, and as it passed a hawk slipped from his owner's wrist, and was saved by the efforts of the boy. This brought him into the notice of the young man who owned the hawk, who was further interested in the lad by his indignant and unslavelike refusal of a reward for his act. Shortly after this, the girl faints near a convent, and is carried in for shelter; and when the monks come

to feed the slaves the owner lifts up his hand against them, and falls into a fit at the same moment. He is taken to a monastery; and there his superstitious fears are worked upon so, that he sells the children, through the monks, for a small sum to the owner of the hawk. He determines to make the boy his companion, and sends the girl as a bower-maiden to his sister.

We need not follow the children through all their vicissitudes; suffice it to say that the account is not only interesting, but instructive as to the times.

The illustrations do not call for any particular remark.

(3) **The Search for the Talisman.** A Tale of Adventure in Labrador. By Henry Frith.

The story by which Mr. Frith gives us descriptions of these Northern regions is ingeniously constructed and well told. What the talisman is, which some four lads, directed by an officer of the navy, go to seek, we will not divulge. A somewhat eccentric old gentleman leaves directions in his will for the search to be made, knowing that those employed in it are bound to learn patience, courage, and other virtues, all important for a useful life. At the same time, we assure our readers that there is a *bona-fide* talisman, which is duly found, and acknowledged to be well worth finding. The six full-page illustrations struck us as rather above the average.

(4) **For Name and for Fame**; or, Through Afghan Passes. By G. A. Henty.

This author's power of teaching history—ancient, modern, and almost present—is so well assured to the reading public and the prize-giving community, that he wants no commendation from the reviewer to sell his books. Have we not gone with him to Cressy, to Seringapatam, to Bunker's Hill, to hear their stories and learn their lessons? and now he would take us through the Afghan passes.

The excessive importance of Afghanistan, as the dividing line between the empires of Russia and England, can scarcely be over-estimated. Mr. Henty, when writing his book, fully expected that the difficulties then existing must have ended in a war between ourselves and Russia. He was, therefore, anxious to put his young readers in possession of knowledge of the country and the people, that they might realise the accounts as they came to hand. Happily, his prognostications have not been verified; but, for all that, the book is very valuable, and thoroughly worthy of the author's fame.

(5) **Yarns on the Beach.** A Bundle of Tales. By G. A. Henty.

There are three tales, of which the first, viz., 'Do Your Duty' (a tale of the French War), fills two-thirds of the little volume. The longer story is in Mr. Henty's usual style, combining history with fiction. The second story is of an entirely different character, but very charming. An old Scarborough boatman, enjoying the soubriquet of 'Surly Joe,' relates to a visitor why he is so called, and how it came about that he no longer deserved the name. The description of two little children bringing their influence to bear upon him is most delightful; and altogether the story is one of the best short stories we have seen for a long time. The scene of the third story is at Falmouth, and tells us how a fishwife had a dream and what became of it. We are not quite sure, as a prize book, that the stories, good as they are, are very wisely published together.

(6) **Marie's Home**; or, A Glimpse of the Past. By Caroline Austin.

The Marie whose name appears on the title-page has very little to do with the story. On her fifteenth birthday her mother gives her a diary of her (the child's) great-grandmother, begging her to read it. After she has gone to see her pony, a birthday present from her father, and had her breakfast, she rushes to some favourite seat in the garden and begins the diary. The reader is supposed to look over the child's shoulder and feel with her in her perusal of the manuscript. The diary is written in a natural style, and the story told therein is well worth reading, giving a graphic account of the last few years of the last century.

(7) **Three Little Ones; Their Haps and Mishaps.** By Cora Langton.

This and the four following books are all bound in the same style, and are of the same price, and are so measured as to cover the same number of pages.

This little story is very simple, and fit for children of eight or ten years of age, by whom it will be thoroughly enjoyed.

(8) **Two Little Brothers.** By Harriet M. Capes.

The two little fellows whose story is told in this book live by the sea, and are, like all other children so placed, influenced by its presence. Towards the middle of the book, quite a long story is inserted of 'Will and His Precious Box,' which is told by the mother. We doubt the wisdom of this for young children. When interested in the heroes of the tale, they do not care to have their patience tried for thirty pages whilst another story is being told which in no way affects the characters of whom they are reading. The illustration which is prefixed to this little volume is decidedly pretty.

(9) **Olive Mount.** By A. S. Fenn.

The frontispiece of this number of the series is quite enough to lead any one to read it, being a well-drawn picture in sepia of a girl interceding with her eldest brother, who is going to punish their brother for leading the sister into a scrape, which ended in an accident.

The account is well written and very interesting, and might, if they would read it, teach many an elder schoolboy the harm he may do to his young brothers and sisters by his example and thoughtless remarks.

(10) **Tom Watkins' Mistake.** By Emma Leslie.

This authoress does not seem quite as happy in writing of her own times as of those long ago. The moral, however, of this tale is very good, and it might with advantage be given to a backward boy leaving school for work.

(11) **A Little Adventurer**; or, How Tommy Treffit went to Look for His Father. By Gregson Gow.

The idea of a small child running away from his grandmother to find his father, who is in Australia, is, to say the least of it, a bold venture. Such, however, we really find here, and very naturally is the narrative given. We leave the reader to find out how the little urchin managed it, and with what result.

(12) **Cleared at Last.** By Julia Goddard.

This and the five following volumes are smaller and with fewer pages than the last series we noticed. Though this book is of less size, and on that account may seem better adapted for little children, the style of this particular volume is older than some of those we have just been mentioning, and, in fact, is not suitable for very young children.

(13) **Little Dolly Forbes.** By Miss Fenn.

This is a pretty little tale of a child being lost at a railway station between her parents and her nurse. She falls, however, into kind hands, and gets on wonderfully well, considering, as her father, without an idea of what had happened, banteringly says to the child's mother just before they discover the fact that she is not with the nurse.

(14) **A Year with Nellie.** By Miss Fenn.

A pretty little book, well adapted for little children.

(15) **Kitty's Cousin.** By Hannah B. Mackenzie.

This book is better suited for children a little older than the last two are. It gives an account of two cousins, one of whom has been brought up in a large farmhouse, to whom the other comes on a visit. The contrast between the girls and their dispositions is cleverly drawn, and the lessons to be learnt useful.

(16) **Wild Marsh Marigold.** By Darley Dale.

The well-known incidents of a London boy being sent into the country, and his joy thereat, and his wrongful suspicion on the disappearance of a parcel, enables the author to teach some valuable lessons in a very palatable form. We heartily recommend it as a suitable gift for a lad of nine or ten.

(17) **Fanny's King, and Other Stories.** By the same Author.

Well-housed, well-fed children never tire of reading of their unfortunate brothers and sisters who have the roughest of homes and the coarsest of food. Why, we do not venture to theorise; but so it is. Here they will be able to gratify their taste. The first story, being one of a little crossing-sweeper, is nicely written, and as fitted for a little girl as the last was for a little boy. The other three tales are necessarily very short.

(18) **Phil Foster.** By J. Lockhart.

This and the three following little volumes are prettily printed in colours without and with a frontispiece within. Here we run along well-known lines. The son of a poor widow, living in a village, executes a deed of bravery, which puts the squire under an obligation to him, which the good squire tries to pay by educating him with his own son. This the squire's son greatly resents, and with the help of an unprincipled tutor inflicts a grievous wrong on the poor lad; how, we will not tell, nor with what result. We confess that we doubt the moral of such stories as being particularly healthy, though the account is graphically given.

(19) **Worthy of Trust.** By H. B. Mackenzie.

This is an account of two schoolboys, and well describes the usual temptations such have to contend with when first going into the world of school. The elder proves himself to be what the title expresses, and tries to keep his younger brother up to the same standard, but does not quite succeed. Of course there is a bad boy, who causes a great deal of trouble. The results, however, are what we should wish them to be, and point the moral that such books ought to. The little volume would be a pretty and useful gift to a lad of ten leaving home for the first time.

(20) **Maudie and Bertie.** By Gregson Gow.

This is written by Maudie, in the shape of a diary. The moral seems to be that gentleness in one, however much children may be prejudiced against him or her, is bound at last to conquer—the conqueror in this story being a governess.

(21) **Holidays at Sunnycroft.** By Annie S. Swan.

Four little children are sent to their grandfather's for a holiday, of whom the elder boy is all, or nearly all, that he ought to be, and the younger the reverse. If it teaches nothing else, it will tell its readers something, at any rate, of the great Bayard.

With regard to the general excellence of the 'get-up' of the following volumes, we have nothing to add to or detract from what has been said of the other parcels sent in by this well-known firm.

(1) **Tom Finch's Monkey and other Yarns.** By John C. Hutcheson.

To the above attractive title there is added, 'and how he dined with the Admiral,' which is quite enough to assure us that, as usual, Mr. Hutcheson is telling us of ship-life, which few, if any, can do better than he. Of the remaining four stories, three are also of the sea, the other one being an account of a cricket match.

(2) **My Mistress the Queen.** By M. A. Paull.

This is a story of the latter portion of the seventeenth century. It is told by the heroine, who goes as a maid of honour to Princess Mary, on her marriage with the Prince of Orange, the interesting narrative ending with the coronation of the king and queen. Many historical personages figure in the account. The author is evidently a great admirer of the princess herself, whose character is well drawn.

(3) **Miss Grantley's Girls, and the Stories She Told Them.** By Thomas Archer.

Ever since the days of Dickens' well-known Christmas numbers, which were wonderfully woven into a single narrative by the great novelist himself, authors have tried to set their own short stories in some sort of single frame. The method adopted here is very simple. Miss Grantley, a schoolmistress, having some work to be done, collects her elder girls day after day for a week, to help her, on the understanding that she is to tell them a story, which she does very much to their satisfaction, and we are quite sure no less to that of the many who will read them.

(4) **The Congo Rovers.** By Harry Collingwood.

The time of this narrative is the reign of George IV., when the slave trade was very brisk. The title-page tells us that it is a 'Story of the Slave Squadron;' so we expect to read of plucky acts of delivery, and we are not disappointed. The book is just what would delight a boy of fourteen or fifteen, and for such we heartily recommend it.

(5) **Through the Fray.** By G. A. Henty.

In this story this clever author has, according to his preface, endeavoured to give an idea of the state of things which prevailed in Yorkshire when the troubles known as the Luddite Riots were rife. We are assured that some of the leading incidents described in the work are strictly accurate in all their details. Mr. Henty has here given us a sketch of what he aptly calls 'peaceful battlefields,' in which all lads, soldiers and civilians alike, have to fight, and with such success as to entitle it to take rank with his other works.

(6) **The Dragon and the Raven**; or, The Days of King Alfred. By G. A. Henty.

The second title of this book will give a clue to the time and the nature of the story. The teaching of history in our elementary schools will have whetted the appetite for such tales as the one of 'The Dragon and the Raven'; and as the narrative is true to nature, the 'Saxon Chronicle' and the 'Life of Alfred' having been carefully followed, the book can be placed in the hands of boys without the fear of its inciting to rash adventure, as is the case with some kinds of fiction. No boy can follow the fortunes of Alfred and the young thane Edmund without feeling proud that England had such a wise king and that the blood of the Saxons still flows in the veins of the people of this country. The story would hardly be complete without the tale of love and rescue; but we must refer our readers to the handsome volume for particulars of Freda's capture and release. We can safely encourage our readers in search of a capital prize, with superb illustrations and binding, good paper, and a well-written story, to place 'The Dragon and the Raven' in the hands of any of their thoughtful boys.

(7) **Brownsmith's Boy.** By G. Manville Fenn.

Just such a book is the one published under the above title as boys will delight in. We have heard it said that dumb animals never make a mistake. Certainly the cats did not in their liking for 'Old Brownsmith.' Brownsmith was a kind-hearted, bluff, honest, market-gardener, who, when his rich uncles had left him to look after himself, took the orphan boy of a captain into his own employ, taught him his business, and tried to make a man of him. The boy, high-souled and courageous, although somewhat spoiled by his training under his invalid mother, amply repaid the kindness of the old man by steady application to his work, by honesty, integrity, and faithfulness. The book is full of adventures; the exciting chase after the little thief in Covent Garden, the burial in the sand-pit, the rescue from the well, the capture of the garden robbers, the picking of the apples, all help to make up a story that one does not like to put down till it is finished. The good influence a thoroughly noble life has upon those who are inferior in moral courage or lower in the social scale are well brought out; and the fact that boys' faults are the result rather of bad training, or want of training, is well illustrated. Shock, the waif, becomes quite a favourite with the reader before the book is finished, and we can even forgive the faults of Philip and Courtney when we see the amends they make in after life. We have had great pleasure in reading the book, and do not hesitate to place it among the best boys' books of the season.

(8) **A Terrible Coward, and Son Philip.** By G. Manville Fenn.

These are two short stories. The first tells the story of Harry Paul, who would not be persuaded to take a dangerous dive from a rock on the coast of Cornwall simply because others had done it, and of his being called a coward for his refusal. Mark Penelly is foremost in giving him this name, and hates Harry because he knows that he himself is inferior to Harry in real courage. How Mark tries to drown Harry, and how the latter heaps 'coals of fire' upon Mark's head by saving him from a watery grave, makes up an exciting tale which it will do boys good to read.

'Son Philip' disappoints the expectations of his fond parents, who had hoped to make a famous man of him by choosing to become a mining engineer for the purpose of saving life in the mines. In trying to abate the recklessness of the men, who are constantly exposed to danger, he makes an enemy of Ebenezer Parks, who, in his desire for revenge, loses his own life. Both stories are well worth reading.

(9) **Little Tottie,** and two other Stories. Told by Thomas Archer.

No feature in the social life of the present day is so prominent as the desire for mitigating the woes of the wretched and unhappy in our large towns, and the story of 'Little Tottie' illustrates the benefit of *créches* and other homes for children, and the good influence a little child has in the reformation of older persons. The story is happily told, and the reader joins in the pleasure of the re-union of the Miggs's family through the kiss of little Tottie.

'What the Rose Did,' how it came to re-unite estranged members of a family, and bring together old acquaintances, and many other beneficial events, may also be read in the book.

'Charity Christmas,' too, tells of the blessing which mercy is to him that gives as well as him that takes. The stories cannot be read without producing good impressions, and leaving the reader better after than before their perusal.

(10) **The Pedlar and His Dog.** By Miss Rowsell.

A tale of old English country life, told with considerable spirit, and in a very interesting manner. Shock, the pedlar's dog, and John Pennycuick, the pedlar himself, have some strange adventures at home and in London. They are the better for becoming acquainted with young Master Coke, who is the means of brightening their lives, and rescuing them from the persecutions of an unfeeling landlord and his ne'er-do-weel son. The book is interesting as illustrating old English life, customs, and superstitions.

(11) **The Penang Pirate, and The Lost Pinnace.** By John C. Hutcheson.

Every boy will read with delight of the clever way in which the pirates were outwitted, overcome, and taken prisoners, and 'Snowball' will, in his way, be as great a favourite as 'Cuddy Headrigg' of ancient renown; while the story of 'The Lost Pinnace,' telling of dhow-chasing off the coast of Africa, and of the terrible sufferings of a shipwrecked crew on the shores of Madagascar, will excite feelings of admiration for Campion and his fellow-sufferers.

Messrs. Hodder and Stoughton's List.

Second Notice.

These volumes are of the most attractive appearance, the illustrations being considerably above the average.

(1) **The True Woman.** By William M. Thayer.

This is an account of several American and other ladies who, by their steady perseverance and honesty of purpose, rise to a considerable degree of usefulness, not unattended by general appreciation. As such it is called in the title-page a book for girls, and this we can honestly endorse. The name of Mary Lyon is made prominent, and in the first chapter, entitled 'Sunrise and Sunset,' we have an account of the effects of her death, etc., with a copy of the inscription on her memorial tablet. The chapters are really short essays on moral and mental culture, illustrated with many anecdotes of well-known women. For an elder girl, as we have said above, the volume would be a charming and most instructive prize.

(2) **Thrown on the World.** By Edwin Hodder.

Two little lads, who lived in Moscow, are first deprived of their parents by false Nihilistic accusations, and then of their faithful nurse by death. They are taken to the celebrated foundling hospital of that city, and there noticed by some English travellers and adopted by them. When big boys they travel, and nature is very considerate to them, Switzerland showing off her avalanches, Etna her lava, Greece, too, kindly exhibits her brigandage, just as Russia does her horrors of Siberian slavery. It will thus be seen that the story is not only amusing but instructive.

(3) **Fritz and Eric; or, the Brother Crusoes.** By John C. Hutcheson.

Here we have the account of two older brothers, one of whom is wounded in the Franco-Prussian War, whence they eventually get home; but they soon start together again for the west, and find themselves in the centre of the whale and seal fisheries. Whilst here they determine to found a new station, and suffer themselves to be left alone, whilst their craft is worked by others—hence the title; and during this period they do very much as other Crusoes do, and with the usual success. Boys, however, will never tire of reading how difficulties may be overcome and enemies of all kinds subdued.

(4) **From Pole to Pole.** By Gordon Stables, C.M., M.D., R.N.

The title of this pretty volume sufficiently indicates what we may expect in it, and we are not disappointed. Though called a 'Tale of the Sea,' the characters are sufficiently often on land to go through some exciting

scenes of hunting, etc., which are graphically told. On going south, the characters come in with slavery, and the scenes connected with it are some of the best written in the book.

(5) **Prudence Winterburn.** By Sarah Doudney.

This story, we are told, was written some years ago, and is now reprinted. The heroine is passing out of childhood, and to girls of the same age the book ought to be useful, as it certainly will be interesting. There is a thoroughly bad woman in the tale, such as any of our daughters and sisters may meet, and against whom perhaps it is as well to warn them, showing the marks whereby such may be recognised.

(6) **Stirring Stories of Peace and War by Sea and Land.** By James Macaulay, M.A., M.D.

This is a handsomely bound volume of 400 pages. Our boys and girls will, however, be more attracted by its contents than by its exterior, though that is handsome. The stories are of thrilling interest, well selected, graphically written, and artistically illustrated. They are chiefly historical or biographical; but they are not confined to any particular country or period. They are calculated to inspire young readers with patriotism, firmness of purpose, uprightness, and devotion to duty. We especially commend it as a gift-book for boys.

(7) **A Little Silver Trumpet.** By L. T. Meade.

This is the story of a little city-bred hero, whose kindliness, honesty, and determination to do right at any cost, form a fine example. The 'Little Silver Trumpet,' was really a marvellous faculty possessed by the boy of imitating birds by whistling. The use he made of it we shall leave our young readers to find out for themselves. The interest in the story is well sustained throughout. The debasing effects of drink, the influence of a loving kiss on a little child, the sustaining power of the Divine love under terrible trials, are all well portrayed. It is a capital book for both boys and girls, and is calculated to draw out their sympathies for their poorer brothers and sisters. It is prettily illustrated.

(8) **Dot; the Story of a City Waif.** By Annie Lucas.

We strongly recommend this most interesting story to the reading of young girls just growing into womanhood. It depicts, in a series of well-painted word pictures, the tragic results of giving way to vanity, ambition, and self-will in youth. Such sad stories as this have their counterparts in real life only too frequently in our crowded cities. Numbers daily sink down in despair in the fight against poverty, remorse, and disease, having no one to hold out a helpful and saving hand. The thoughtless and hard-hearted employer of sempstresses, the drunken but kind-hearted costermonger, the foster-mother of Dot, the little Christian newspaper boy, the devoted servant of God, Dot's Sunday-school teacher, are such well-drawn characters that they will be immediately recognised and not soon forgotten. We read it with unflagging interest to the end, and are sure that our young readers will rejoice, as we did, that a story with so sad a commencement is brought to a bright and happy termination. This book, also, is very prettily illustrated.

(9) **The Will Power: Its Range in Action.** By J. Milner Fothergill, M.D.

The title of this book will lead some of our young readers to suppose that it is a 'dull, uninteresting' volume. We should advise them to read a few pages before coming to too hasty a conclusion. When once commenced, it will not easily be laid aside. In flowing and graphic language the writer shows that the motto of the book—'Where there is a will there is a way'—has been the mainspring of the greatness of some of our greatest men. The lives of Thomas and Oliver Cromwell, Wellington, Livingstone, Garibaldi, and many others, are reviewed to this end. The effect of '*will*' on the success of men in their daily avocations, as well as its power in enabling them to overcome many difficulties and even diseases, is well depicted. We strongly recommend a perusal of this book to our 'young men and maidens' just entering into life, and endorse the wish of the author that its study may help some, at least, of those who read it to plant their feet more firmly when fighting the battle of life.

(10) **Dessie Fennimore.** A Tale of Country-town Children. By S. K. Hutton.

This book, of large dimensions, interests by the beauty and manliness of the characters which are portrayed in its pages. The whole scene comes as a reminiscence of life a generation back, and has its special value for that reason. It is the story of two young girls transplanted from the natural surroundings of a home, and left to stand very much upon their own strength of character and natural impulses. The description of the coach ride to Burley is charming, and the character of Dessie's guardian is capitally drawn. We doubt the propriety of introducing the question of the 'Blasphemy Laws' into a work designed for young children, but it is done so delicately that little objection can hold as to the manner in which it is treated. The work is one which, though not perfect in form or detail, is nevertheless calculated to inspire in our young people a love of truth and a desire for justice in every relation of life.

Messrs. Nelson and Sons' List.

Second Notice.

(1) **Archie Digby.** By G. E. W.

This is an account of a fair specimen of an Eton boy, who spends his Christmas vacation with a wealthy uncle, aunt, and boy cousin. On going from the station to the castle, on his arrival for his visit, an unfortunate accident happens, which is cleverly made to be the important strand in the boy's cord of existence while there. The cousin is his very opposite in nearly every way, and the contrast is well portrayed, and serves to teach some useful lessons.

(2) **Famous Caves and Catacombs.** By W. H. Davenport Adams.

This is, perhaps, a little too learned to be very acceptable to the ordinary run of boys; at the same time, to us it was very interesting and full of information. We are sorry not to be able to occupy more space in describing its scope and intention.

(3) **Salome.** By Mrs. Emma Marshall.

The sudden ruin and death of the father of the heroine brings to the fore the strong traits of her character, which in luxury and idleness had been hidden. A brother who was at Eton does not succumb to his altered circumstances so readily, and is the cause of a great deal of trouble and anxiety; he too, however, is eventually conquered and altered by the winning patience of his sister. We must not, however, omit to mention a gracious, self-denying aunt—rightly named Anna—who is one of the most charming characters we have met with for a long time.

Cæsar de Bello Gallico. Book I. With two translations. By John Hugh Hawley. Relfe Brothers.

Mr. Hawley has introduced, at the beginning of his work, a preface which demands more attention than those to such works generally do. He explains carefully not only what he has done—viz., given two translations, the one, phrase for phrase, side by side with the Latin words, and

the other (on the opposite page) of the ordinary kind, which is printed beneath the Latin text—we say he not only tells us this, but he goes on to tell us why he has done so. He seems to think that schoolmasters have given up the idea that their business is to teach what is right, but to correct what is wrong. He maintains that the wrong notions that a boy gets, after, may be, a certain amount of trouble and work, are far more likely to stick to him than their corrections, however carefully made. He strengthens his remarks by quoting from old Roger Ascham's 'Schoolmaster,' who had very strong notions as to a schoolmaster's duties.

Nearly all really good schoolmasters who have had a fair amount of experience are accustomed to go through the next day's lessons with their classes, explaining those difficulties or idioms which the pupils could not naturally be expected to see through; and this Mr. Hawley would let his book do for them.

With regard to Latin exercises, Mr. Hawley quotes both Long and Ascham, who think that they ought always to consist of retranslation into what was written by a Latin author, that there may be no doubt as to the fitness of the words used and the order; and we quite agree with him.

No schoolmaster worthy the name objects to a boy using a key or crib to his work, provided, of course, that he knows the fact, as he can see that his pupil supplements and impresses the knowledge he thus obtains by careful work with his dictionary and grammar.

At the end of the preface the author modestly asks for suggestions for improvements. In addition to the phrase-for-phrase translation there is absolutely no assistance whatever, which we think a mistake—*e.g.*, on page 113 we found the following: '*neque fecisset*, and had not made (given); *potestatem sui*, an opportunity of (approaching) him.' Surely such a use of '*sui*' requires some explanation, even though the student might find it in a fair-sized dictionary; and we can't help thinking that there might be a little more connection shown between the phrase-for-phrase translation and the freer one, which could easily be done by insertions within brackets.

The book, with the notes suggested, would be a very valuable book to one teaching himself; and to such we heartily recommend it, even in its present form. As a class-book, it could not be used in any school by boys, however young. No teacher could test his form's work if it was allowed to be 'brought up.'

We are glad to notice that Mr. Hawley thinks the speeches of Cæsar far too hard to be included in a first, or even second, reading of his Commentaries.

How to Pass Ninety per Cent. and Earn 'Excellent.' By One Who Does It. John Heywood: Deansgate, Manchester.

We do not know how many of our readers wish to know how the above is accomplished. Some already earn more than ninety per cent. and *don't* get the 'excellent' merit grant. There is nothing more uncertain than the kind of report a teacher may receive. But if any one wishes to know what methods are adopted by 'One who does it,' in order to get 'excellent,' he will find them plainly set forth in this manual of school methods. It does not pretend to be a 'Theoretical School Management,' but a plain statement of what to do and how to do it. Pupil teachers, assistants, and young teachers generally, will find it full of practical hints and sensible methods of securing real progress, as well as mechanical ability, to get a pass from Her Majesty's inspector. We have read it with care and pleasure, and can fully endorse much of what is here written, and so can cordially recommend the book, although we could well have spared the title given to it.

[Owing to pressure on our space, we are compelled to hold over *Science Notes*, *School Song*, *Notes of a Lesson on the Movements of Water*, and several *Reviews*.]

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